NAVAL SAFETY CENTER

ANNUAL REPORT

2019

OUR MISSION

The Naval Safety Center prevents mishaps to save lives and preserve resources. The advice, policies, services and risk management information and tools it provides, enhance command culture, combat readiness and global warfighting capabilities.

OUR VISION

Empower all Sailors, Marines, civilians and their families to collectively embrace a proactive command culture of risk identification and management to achieve zero preventable mishaps.

GOALS

Shape the Naval Enterprise toward a culture of improved Safety Risk Management.
Integrate Safety Risk Management through all Naval Enterprise lines of operation.
Improve safety and risk management information sharing.
Increase organizational efficiency and effectiveness.

U.S. Navy front and back cover illustrations by Catalina Magee and Paul Widish

Commander's Statement

Mark L. Leavitt

In 2019, your Naval Safety Center team continued to refine itself as a forward-looking organization through significant internal organizational improvements that helped us provide critical support, informative products and relevant resources across the Navy and Marine Corps.

As we head into 2020, we remain your safety advocate with a steadfast commitment to fostering a culture of professionalism and excellence throughout all warfare communities. Whether serving at sea, ashore, or overseas, our Sailors, Marines, civilians, and family members are our greatest asset. In an era of great power competition, we live and operate in a sophisticated environment that demands we conduct business with a sense of relentless urgency.

Safety both on and off duty, directly relates to the lethality of our Navy and Marine Corps team and we need your help to get after it! Far too often, mishaps are preventable; through a deliberate emphasis on procedural compliance and risk management, we will continue to save lives and preserve readiness.

As we progress into 2020 and beyond, you can count on us to:

• Continue to work with stakeholders, external organizations, and safety professionals throughout the Fleet to aggregate data sources in order to strengthen our ability to assess the health and risk level of units. This information will assist leaders in making decisions that reduce unnecessary exposure to risk.

• Provide critical information and awareness through a complete information process from data procurement, analysis, product generation, and public dissemination. Through relevant lessons learned, sanitized Safety Investigation Reports, in-depth analytical studies and command visits and assessments, we will remain fully engaged in increasing safety awareness and mitigation strategies across all warfare communities.

• Maximize opportunities to learn and grow as an organization. High-velocity learning is central to the Fleet's safety culture and that remains one of our top priorities. We will continue to expand our data analytics workforce to provide more profound studies and clear and timely analysis.

The Naval Safety Center looks forward to a new year with each one of you. Together, we will create a Culture of Excellence in everything we do. We look forward to hearing from you as we work toward the common goal of preserving combat readiness and saving lives.

We Are Your Safety Advocate

• Policy, doctrine, and guidance;
• Safety trend communication;
• Advanced analytics and sophisticated modeling;
• Forward-looking risk assessment;
• Training and education;
• Multimedia products.

ANNUAL REPORT 2019

CONTENTS

EXECUTIVE SUMMARY

This annual report provides a snapshot of the mishap trends across our Navy and Marine Corps in FY 19. As you study the information in these pages, you will see that mishaps, many of them preventable, transcend both time and warfare communities. This report provides you an opportunity to study the data and lessons learned, to look for ways in which you can adjust your own mishap prevention efforts as you go about your daily routine both on and off duty. There are many areas where we can work together to identify commonalities in mishaps and share information and successful mitigation efforts that benefit everyone.

Common Themes Across Warfighting

Human factors and procedural non-compliance remain the top safety issues across our Navy and Marine Corps. The FY19 studies show we need continual focus on command oversight, greater emphasis on mission planning, and better communication. A crew leadership push, along with effective communication of critical information, and following standard procedures will help decrease mishaps. This focus will break down barriers that foster complacency and over confidence and will help lower performance-based errors.

Unit Safety Assessments

Naval Safety Center conducts assessments to improve unit operational readiness through identification of unsafe conditions, practices, procedures, and to increase the hazard awareness of unit personnel through proper application of risk management. A safety assessment allows NAVSAFECEN personnel to evaluate the risk management and safety culture, as well as share and disseminate best practices, instructions, and lessons learned gained across the enterprise. Through continuous collection and trend analysis of multiple data streams, NAVSAFECEN will evaluate the level of risk for Navy and Marine Corps units and leverage this information to determine the relative priority for a safety assessment. Specifically, a unit assessment:

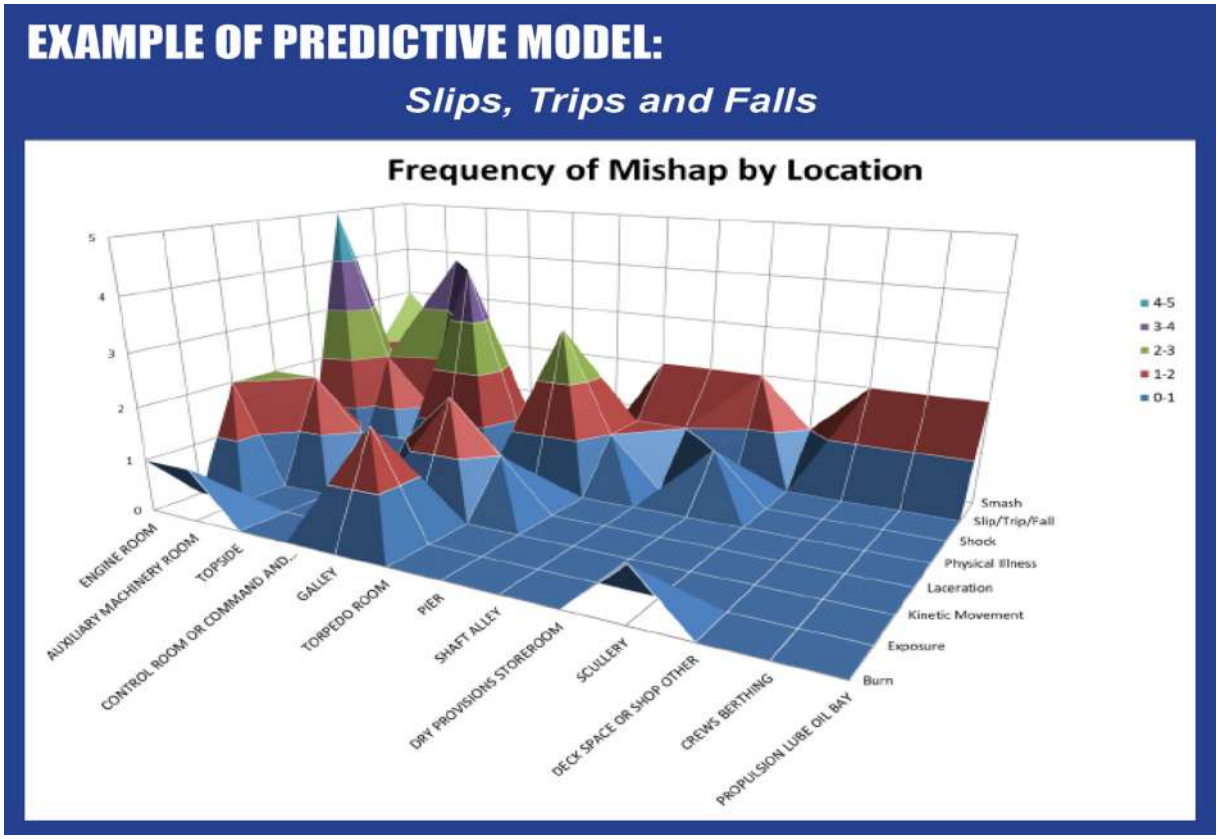
a. Evaluates the safety culture (processes, manning, training, and equipping) and provides specific feedback to enhance efficiency and effectiveness of Navy and Marine Corps units.
b. Collects unit data to support community-wide trend analysis, distributing information laterally to enhance the informal exchange of mishap prevention and hazard abatement information to the mutual benefit of the assessed activity, NAVSAFECEN, and other operational units.
c. Collects and disseminates critical risk and/or systemic trend information to Navy and Marine Corps leadership.
d. Provides fleet engagement and safety promotion opportunities to COMNAVSAFECEN.
e. Assesses risk management through research and analysis, individual interviews, and in-process observations.

Active Class A Reports

Mishap Command	Date of Mishap	Current Endorser	Current Endorser Time (Days)	Community
VMM-261	11-Jul-17	COMMARFORCOM	82	Aviation
VFA-22	5-Aug-17	COMNAVAIRPAC	394	Aviation
VFA-146	12-Aug-17	COMSTRKWINGPAC	110	Aviation
VMM-364	28-Sep-17	SP MAGTF	169	Aviation
VRC-30	22-Nov-17	COMNAVAIRPAC	34	Aviation
VFA-213	14-Mar-18	COMSTRK FIGHTER WING LANT	16	Aviation
HMH-465	3-Apr-18	AIRCRAFT MISHAP BOARD	601	Aviation
VFA-115	9-Jun-18	AIRCRAFT MISHAP BOARD	534	Aviation
HMLA-169	3-Aug-18	NAVSAFECEN	287	Aviation
VAW-120	17-Sep-18	CVN-77	17	Aviation
VMFAT-501	28-Sep-18	NAVAIRSYSCOM	104	Aviation
HSM-77	18-Oct-18	CVN-76	33	Aviation
VFA-102	11-Nov-18	AIRCRAFT MISHAP BOARD	78	Aviation
VMFA(AW)-242	5-Dec-18	NAVSAFECEN	34	Aviation
VMM-264	5-Jan-19	AIRCRAFT MISHAP BOARD	324	Aviation
VQ-3	7-Feb-19	COMSTRATCOMMWING ONE	23	Aviation
VMFA-323	28-Feb-19	NAVSAFECEN	80	Aviation
VMFA(AW)-224	3-May-19	AIRCRAFT MISHAP BOARD	206	Aviation
VT-21	10-May-19	CNATRA	12	Aviation
VMA-542	20-May-19	MAG-14 2D MAW	28	Aviation
VFA-151	31-Jul-19	VFA-151 CO	16	Aviation
HMH-465	6-Jun-19	AIRCRAFT MISHAP BOARD	172	Aviation
HSM-71	7-Aug-19	HELMARITIMESTRKWINGPAC	43	Aviation
VAW-121	8-Aug-19	COMNAVAIRLANT	16	Aviation

Knowledge Management and Safety Promotions

Example of Data Analysis



DIRECTOR: **DR. KIRK HORTON**

KNOWLEDGE MANAGEMENT: **NAVSAFECEN_CODE51_KNOWLEDGE_MGMT@NAVY.MIL**
SAFETY PROMOTIONS: **SAFE-CODE-52-SAFETY-PROMOTIONS@NAVY.MIL**

The KMSP Directorate reaches across all warfare communities and areas of expertise of the Naval Safety Center. The directorate officially formed in 2018 as part of NAVSAFECEN's transformation into a forward-looking, data-driven organization that provides advanced analytics and sophisticated modeling data that can be used to prevent mishaps.

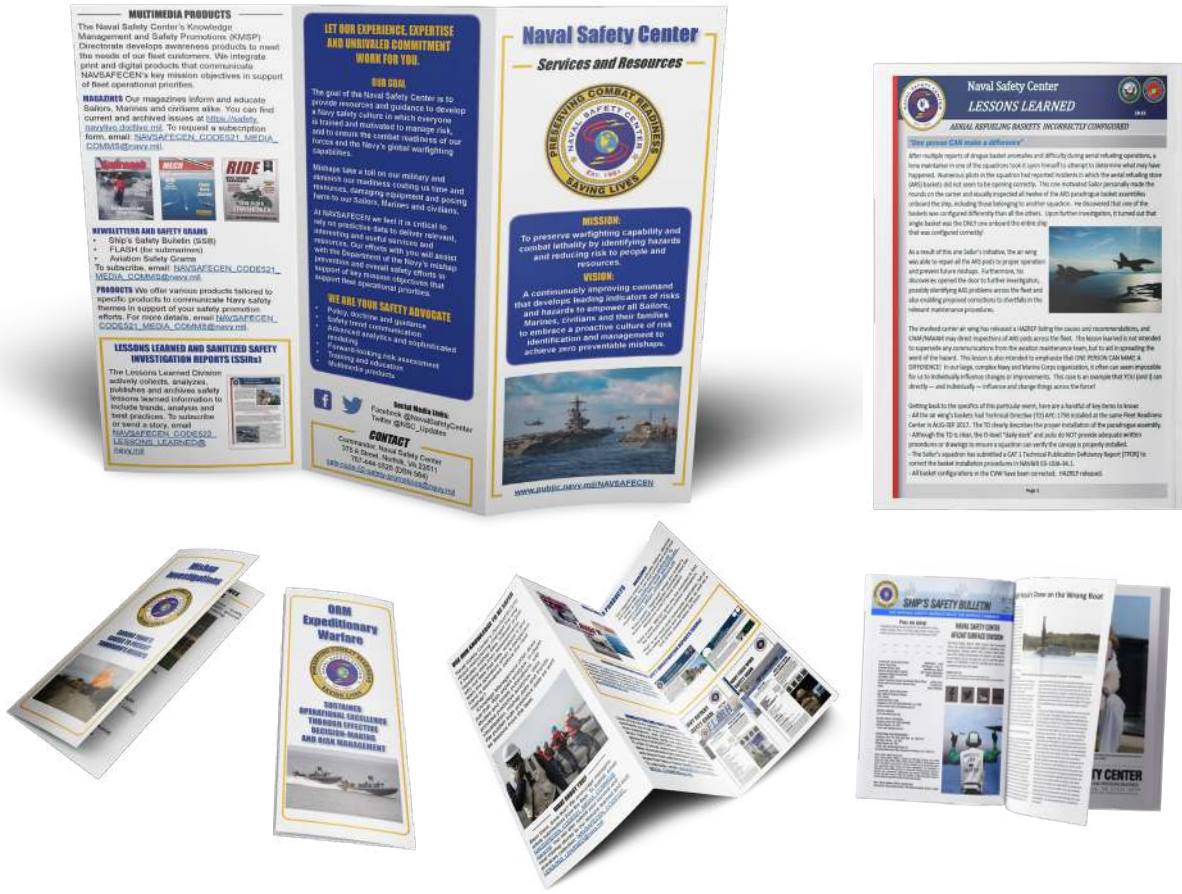
The directorate spent FY 19 providing advanced data analytics as well as in-depth studies, trends, data visualization, and awareness products to the fleet in order to promote a culture of excellence across the Navy and Marine Corps, directly contributing to the overall mission of preserving readiness and saving lives.

The KMSP Directorate provides subject matter expertise in the following areas: operations research and data analytics, studies, lessons learned and sanitized safety investigation reports, media and communication products, and collaboration with safety partners and allies.

Operations Research and Data Analytics

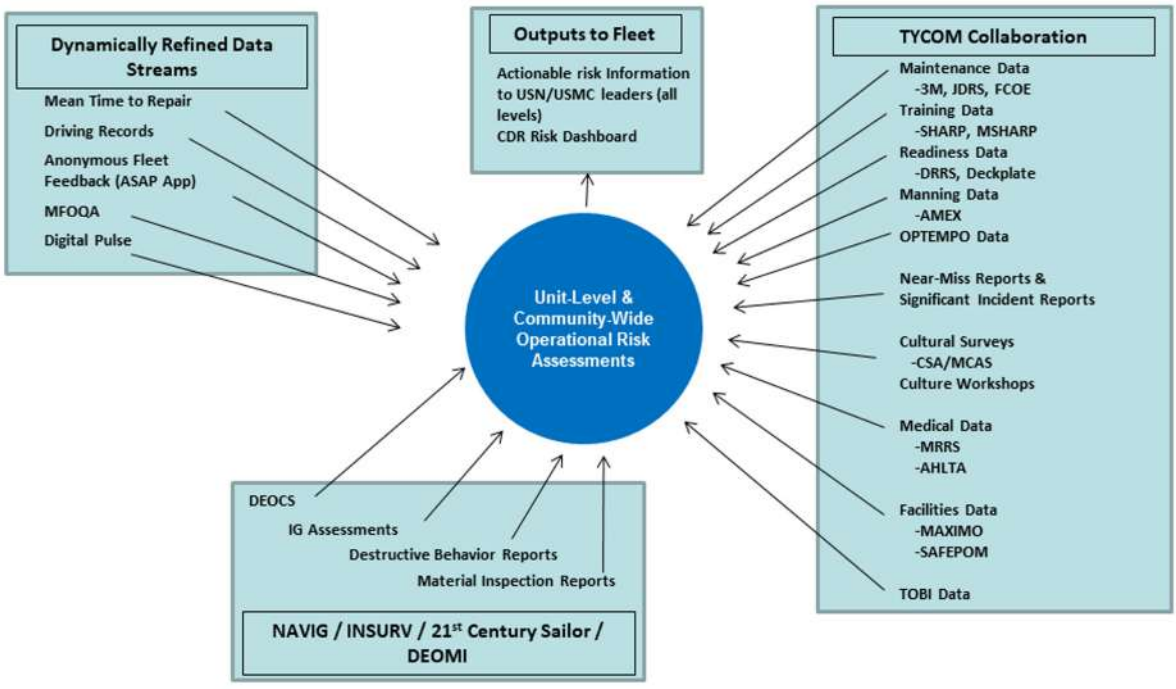
Commander, Fleet Forces Command implemented a campaign plan for the Fleet to achieve safety goals for FY 2016-2019. Promulgated by means of an operations order and two fragmentary orders, the campaign plan established the following goals:

- COMNAVAIRFOR achieves a fiscal year aviation flight and flight related mishap rate of .79 per 100,000 flight hours by 1 October 2019;
- COMNAVAIRFOR achieves an aviation ground mishap rate of 5.0 per 100,000 flight hours per fiscal year by 1 October 2019;
- Total Fleet (USFF and CPF) shipboard class alpha mishap damage fire events is zero for fiscal years 2016 to 2019;
- Total Fleet (USFF and CPF) shipboard fires for all mishap classes is less than 16 per fiscal year by 1 October 2019;
- USFF and CPF achieve a combined seamanship fiscal year mishap count (i.e., all mishap classes of collisions, allisions, and groundings) of less than five events per fiscal year by 1 October 2019;
- USFF and CPF maintain a zero class Alpha dive mishap count per fiscal year through 1 October 2019; and
- USFF and CPF achieve a combined overall fiscal year off-duty fatality rate of 10 per 100,000 active duty fleet personnel by 1 October 2019.



The above depictions are safety promotion materials produced by KMSP. Refer to page 17 for more information about these products.

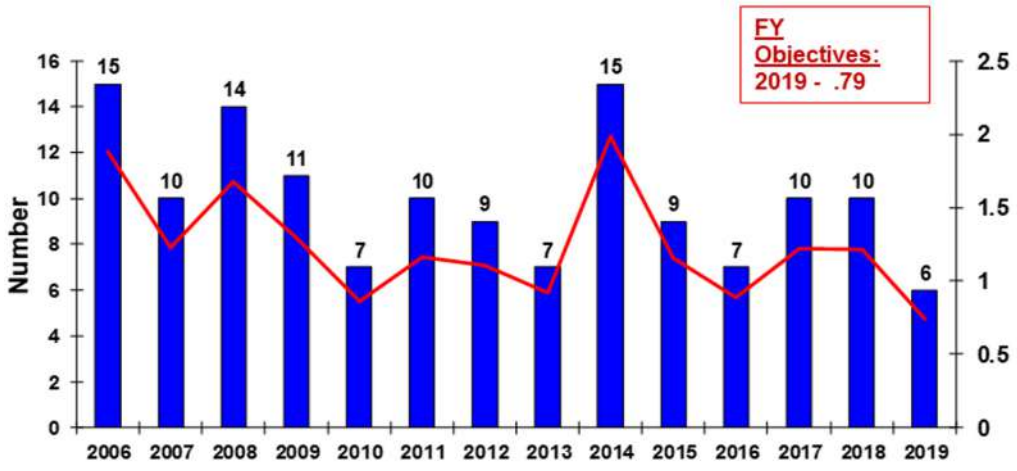
Current Collaborative Data Streams



Mishap Number **Mishap Rate**

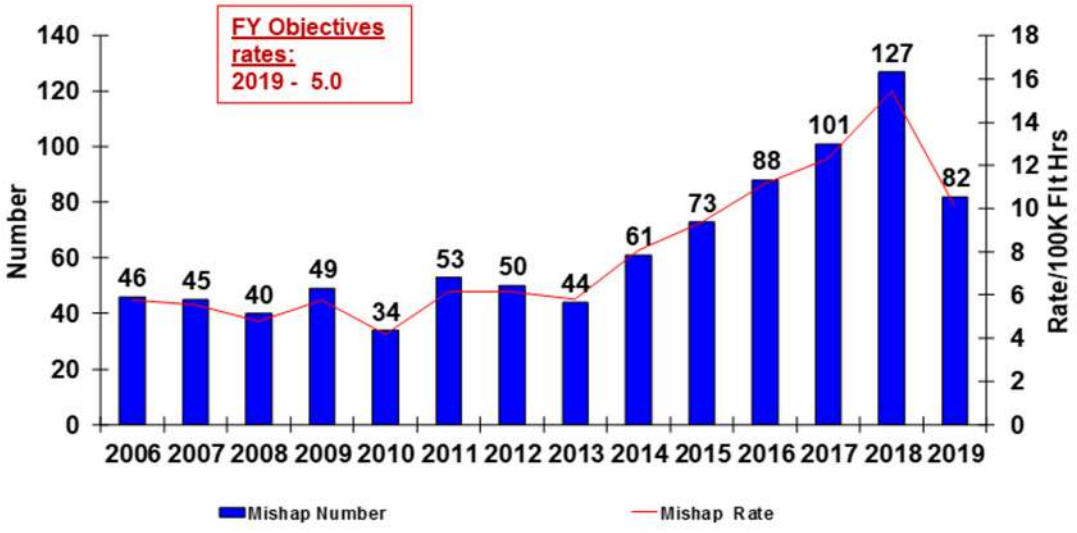
1. The rate for aviation flight and flight related mishap rate was not reached, ending at a rate of .89 mishaps per 100,000 flight hours.

Aviation Class A Flight and Flight-related Mishap Reduction Goal



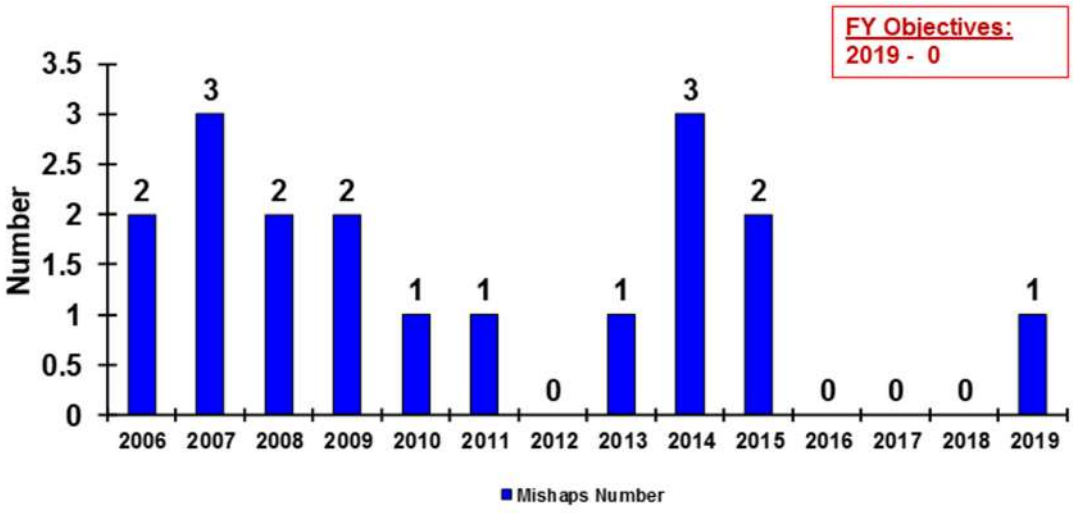
2. The aviation ground mishap rate was not reached, ending at a rate of 10.3 mishaps per 100,000 flight hours.

Class A/B/C Aviation Ground Operations Mishap Reduction Goal



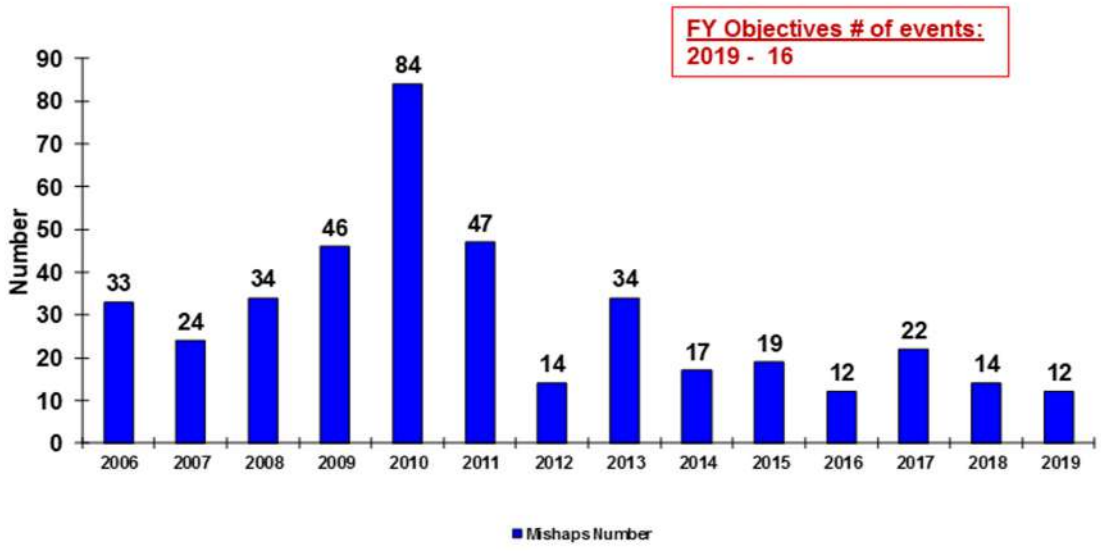
3. Reducing the number of Class A fires was almost achieved, with only one fire being reported prior to 1 October 2019.

Shipboard Class A Fire Mishap Goal



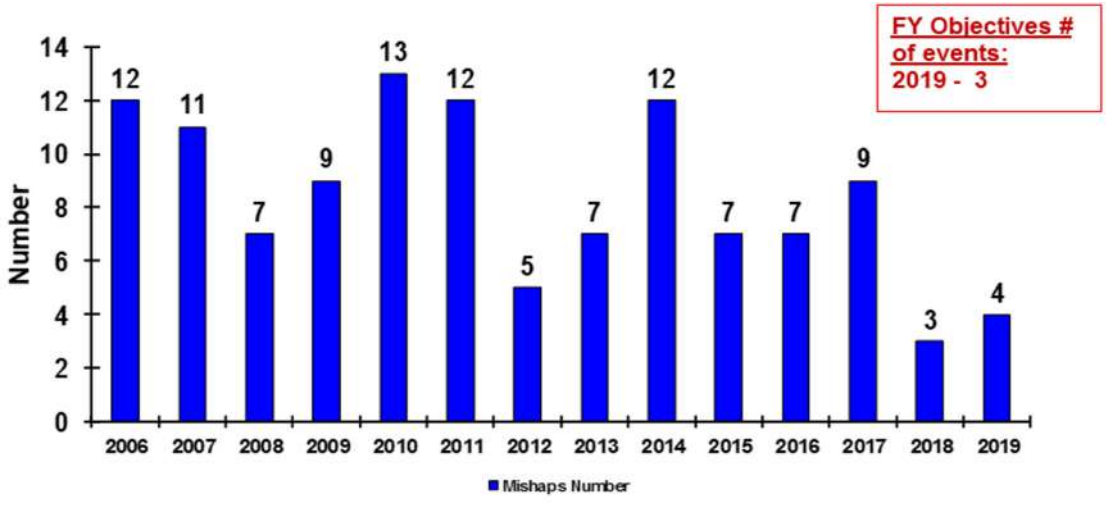
4. The all-shipboard fires goal was achieved, with less than 16 fires per fiscal year reported in 2018 and 2019.

All Shipboard Fires Mishap Goal



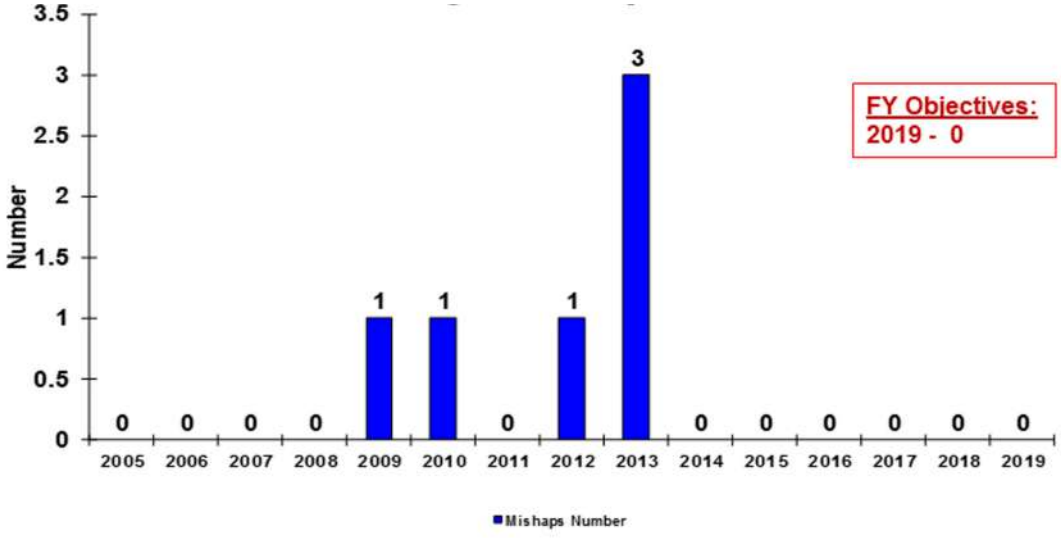
5. The seamanship goal was not accomplished, due to 7 incidents reported in 2016, and 9 in 2017. The Fleet did reduce the number of seamanship mishaps in 2018 and 2019.

Seamanship Mishap Goal



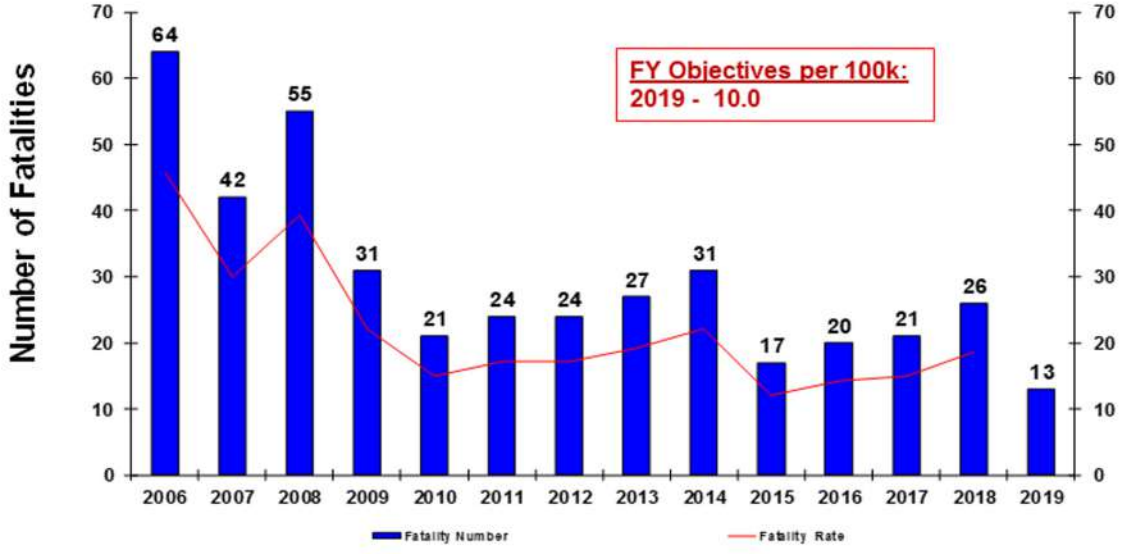
6. The fleet did maintain a zero Class Alpha dive mishap count through the reporting period.

Diving Mishap Goal



7. The goal to reduce the number of off duty fatality rate was achieved, with a rate of 9.86 fatalities per 100,000 personnel.

Fleet Off-Duty Mishap Goal



KMSP STUDIES

KMSP has conducted a variety of in-depth studies to address safety issues across the fleet. The abstracts from four of the studies are included here. For more information on each study, please reach out to: **NAVSAFECEN_CODE51_KNOWLEDGE_MGMT@navy.mil.**

Pathways to Failure Study

KMSP Operations Research Analysts Dr. Shari Wiley and LT Andrew Miranda conducted in-depth research using DoD HFACS to find potential "pathways to failure" that can lead to aviation safety incidents. DoD HFACS examines underlying human causal factors in an effort to reduce aviation accidents. The system identifies specific human error tendencies, categorized within the "Unsafe Acts" tier. It shows how human error is often the result of difficult working conditions shaped by "upstream factors" that are categorized within the "Preconditions," "Supervision," and "Organizational" tiers.

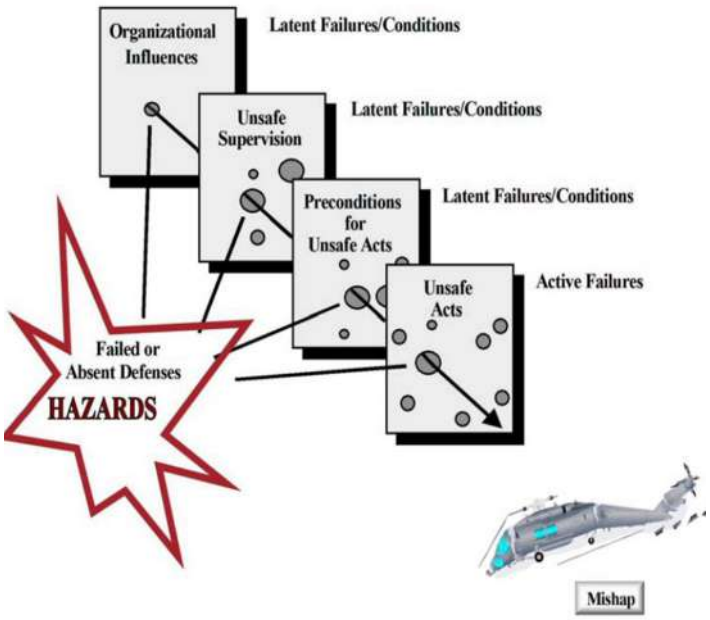
The goal of the research was to identify what upstream organizational factors influence front-line operator performance (aviators, maintainers, or supervisors). Dr. Wiley and LT Miranda analyzed a DoD HFACS data set populated by six years of Naval Aviation to find potential "pathways to failure," beginning with the top "Organizational" tier and analyzing the tier-to-tier relationships of all categories down to the "Unsafe Acts" tier.

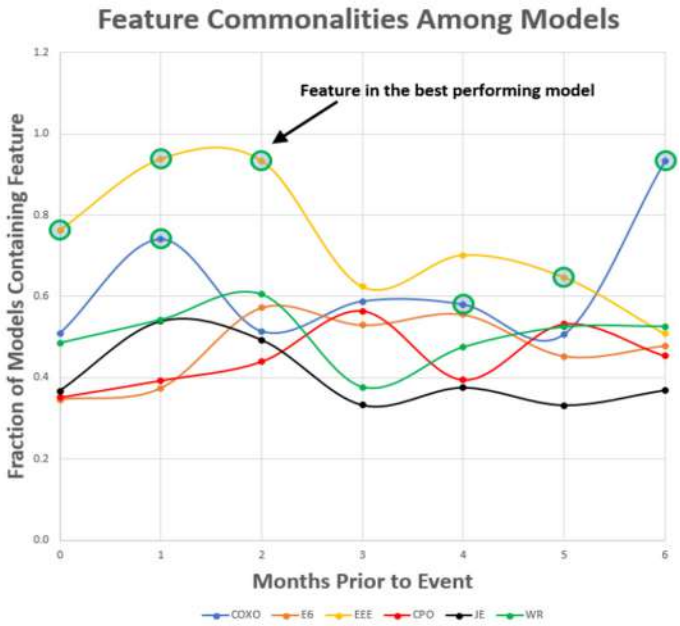
The data set was comprised of historical HFACS data gathered from 984 Naval aviation mishaps from 2011 through 2016. They conducted a logistic regression analysis, which is used to describe the relationship between a dependent variable and one or more independent variables. For this research, it was assessed whether the higher tier HFACS categories were significant predictors of lower tier HFACS categories.

The strongest pathway through each tier was as follows: organizational policy or process issues, inadequate supervision, teamwork, judgment, and decision-making errors. To interpret these quantitative results further, they conducted a content analysis of the narratives, lines of evidence, and HFACS analyses from mishap reports. The results suggest that policies and procedures performed by front-line operators may not resemble how work is actually performed. This is due in part to lack of accuracy and consistency in publications across commands, and communication breakdowns from chain-of-command to crew members.

Experiential Z-Score Analysis Study

Accident prevention has gone through many stages throughout its long history, from the original domino theory (c. 1931) to the theory of human factors and the more recent "swiss cheese" model. The introduction of big data analysis into this mix is an attempt to quantify the factors that go into these models by leveraging the data management efficiency of high capacity dedicated computational systems guided by a knowledgeable data science team. In many cases, the resulting conclusions can be both enlightening and non-intuitive. This report provides detailed explanations that describe the development of a machine learning model that will take routine data from fleet assets and provide a risk assessment based on these factors. This document explains the development of the experiential z-score portion of the model used to quantify the level of collective experience present on an afloat command and use that to estimate the additional risk of an incident occurring that might rise to the level of national attention (e.g. a collision or grounding). Just as importantly, it describes actions that can be taken to minimize that risk and perhaps avert an incident.





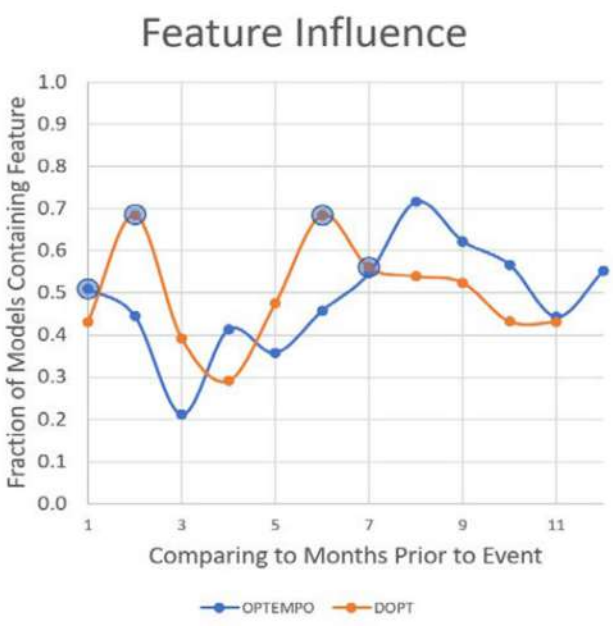
KMSP STUDIES

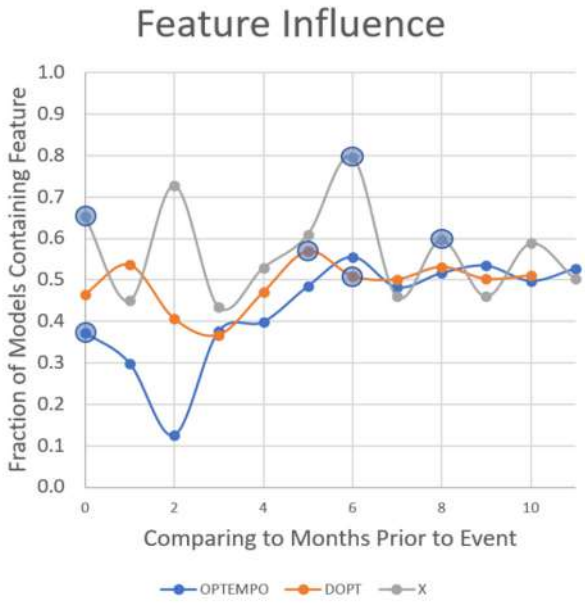
OPTEMPO Analysis Study

This report is the second in a series devoted to refining a risk analysis model for operational assets within the Navy. This installment analyzes the relationship between OPTEMPO – time at-sea and risk. Time at-sea is analyzed in two different ways: as absolute time at-sea on a per month basis as well as fluctuations in time at-sea from month to month. This analysis shows that there is a relationship between OPTEMPO and risk of mishap and that there is a constructive rapport between the experiential z-score model and the OPTEMPO model. That is, the total number of ships that are indicated by one or both models is greater than with either model alone, and any ships indicated by both models can almost certainly be considered at-risk with very little chance that the result is a false positive. OPTEMPO was selected as a variable of interest because highly aggressive schedules have been cited, as a root cause for missed training opportunities, and missed maintenance.

Operational Volatility Analysis Study

This report analyzes the elements of OPTEMPO -time at-sea and crew volatility with respect to risk; these elements taken together are referred to as operational volatility. Time at-sea is analyzed in two different ways: as absolute time at-sea on a per month basis as well as fluctuations in time at-sea from month to month. Crew volatility is quantified as the fraction of personnel on board a ship today that were not there a specified time ago. This analysis shows that there is a relationship between operational volatility and risk-of-mishap and that there is a constructive rapport between the experiential z-score model and the Operational Volatility model. That is, the total number of ships that are indicated by one or both models is greater than with either model alone and any ships indicated by both models can almost certainly be considered at-risk with comparatively little chance that the result is a false positive.





Note: DOPT in above models is differential operational tempo

The Knowledge Management and Safety Promotions Directorate was created as part of the Naval Safety Center's transformation in 2018. The addition of the KMSP Directorate allows the organization to provide advanced analytics and sophisticated modeling data to the Fleet and Marine Corps that can be used to prevent future mishaps, preserve readiness, and save lives.

Studies

During FY19 the KMSP Directorate and community Safety Directorates completed the following studies:

Aviation

- Rising trend of discoveries of serious depot level maintenance errors and malpractice
- Class B mishap root-cause analysis FY15-FY18
- Naval airport infrastructure study
- Aircraft maintenance maintainer head
protection study
- Shortfalls in IMRL and GSE study
- Second study of aircraft cannibalization rates involving FY14-FY18 for F/A-18, H-60, H-53, and V-22 Class A-D mishaps and maintenance data to determine the cannibalization rate, in which the risk of a mishap is more likely to occur
- Deteriorating material condition of Ready
- Service Lockers/Magazines
- Reoccurring mishaps and hazards due to cross wiring of UH-1Y flight control cables
- Search and rescue (SAR) response in
ITRA-South, Iwakuni
- H-53 Structural Issues
- H-60 Aviation Ground Mishaps
- Thermion flight deck coating

To receive our studies, send an e-mail to:
Aviation-safe-code-11@navy.mil

Afloat

- Mishap investigation 101
- Underreporting of fires
- Safety half-life
- Hazard abatement
- Stress-induced injuries
- Small boat operations
- Fasteners/screws/bolts
- Electrical safety
- Electrical hazards
- Electrical work benches
- Gun handling/misfirings/negligent discharges
- Afloat deep sink burns

To receive our studies, send an e-mail to:
Afloat-safe-code-12@navy.mil

Expeditionary

- Micro-narrative capture (Pulse Scan)
- Sun exposure for NSW and NECC personnel (in collaboration with Navy and Marine Corps Health Center)
- Possible drivers for aviation ground mishaps (in collaboration with CNA, Ernst & Young and CNAF)

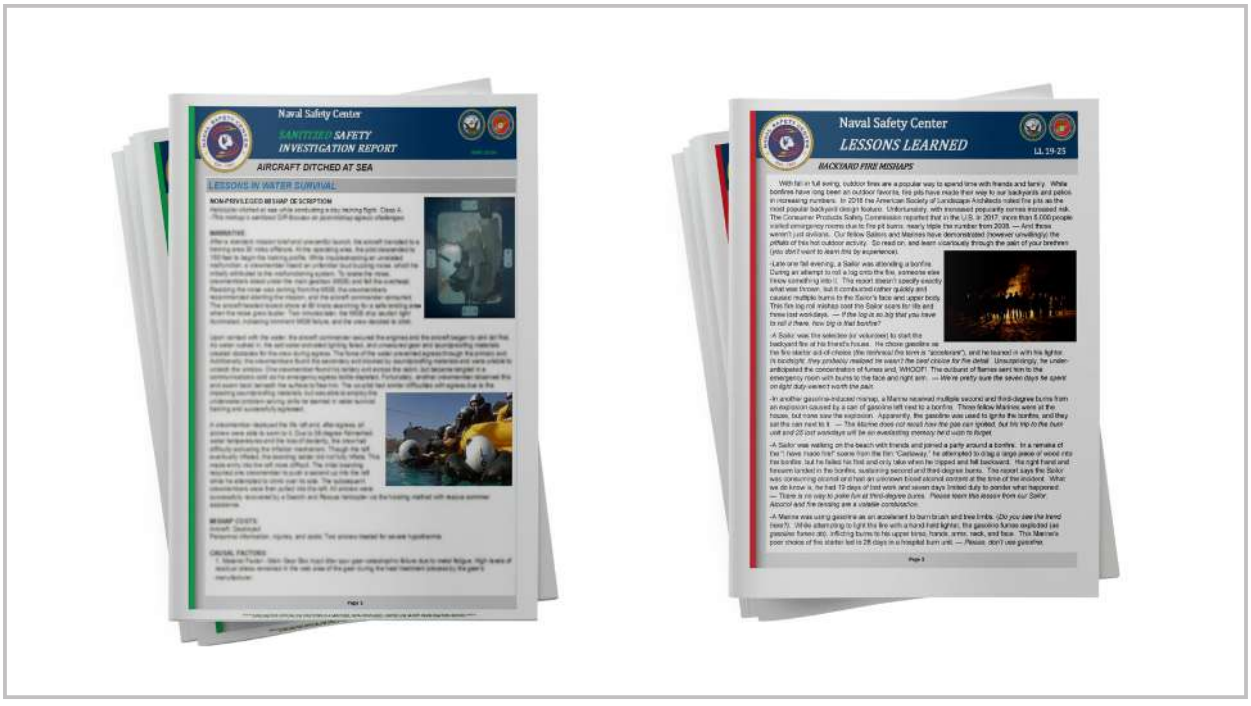
To receive our studies, send an e-mail to:
Expeditionary-safe-code-40@navy.mil

Lessons Learned and Sanitized Safety Investigation Reports

During FY19 the Naval Safety Center developed and disseminated the following Lessons Learned and Sanitized Safety Investigation Reports for the Navy and Marine Corps:

1. LL 18-15 Navy Off-Duty Firearm ND
2. LL 18-16 Helo Sonar Losses
3. LL 18-17 Shipboard Aircraft Refueling Contamination
4. LL 18-18 Why Don't We See Motorcycles
5. LL 19-01 Hearing Loss
6. LL 19-02 Aircraft Move Briefs
7. LL 19-03 UH-1Y Crossed Flight Control Wiring
8. LL 19-04 Firefighting w/composites
9. LL 19-05 Embedded Trainers
10. LL 19-06 Trailing Hand Technique (Afloat version)
11. LL 19-07 Shore Fixed Ladder Fatality
12. LL 19-08 Trailing Hand Technique (Shore/Civ version)
13. LL 19-09 UTV Mishaps
14. LL 19-10 Fixed Fire Suppression Systems
15. LL 19-11 Demolitions Training
16. LL 19-12 Antenna Dome Ripped from Mounting
17. LL 19-13 The "Half Life" of Scared
18. LL 19-14 Office Space Mishaps
19. LL 19-15 Screening Aircraft Components
20. LL 19-16 Off-Duty Firearms
21. LL 19-17 Mishaps Averted
22. LL 19-18 Knife Mishaps
23. LL 19-19 Right Work, Wrong Ship
24. LL 19-20 Aviation Support Equipment Shortfalls
25. LL 19-21 Soccer Goal Anchoring
26. LL 19-22 Electric Scooters
27. LL 19-23 Six Traits of a Mishap Ship

All of these Lessons Learned are available on the "Lessons Learned" pages of the Naval Safety Center's CAC-enabled website: **https://intelshare.intelink.gov/sites/navsafe**



Sanitized Safety Investigation Reports

SSIR 18-08 MTVR Rollover
SSIR 18-09 Surface MPDE Mishap
SSIR 18-10 Shipboard Fire in the Engine Uptake
SSIR 18-11 Carrier (CVN) Hangar Bay Aircraft Fire
SSIR 19-01 Flight Deck Wave Incursion
SSIR 19-02 Helo Mountain Crash
SSIR 19-03 Flight Deck Aircraft Collision
SSIR 19-04 TH-57 Wire Strike
SSIR 19-05 Rocket Live Fire Mishap
SSIR 19-06 Hot Gun Clearing Mishap
SSIR 19-07 LAW Firing Mishap
SSIR 19-08 Shipboard Electrical Mishap
SSIR 19-09 Aircraft Ailerons Damaged During Maint
SSIR 19-10 Helo Water Impact
SSIR 19-11 Ship Ballast Tank Rupture
SSIR 19-12 Small UAS Mishap
SSIR 19-13 Rotary Wing UAV Mishap
SSIR 19-14 Aircraft Ditched at Sea
SSIR 19-15 Aircraft Gust Lock HAZREP
SSIR 19-16 On-Duty Small Arms Mishap
SSIR 19-17 Machine Gun Clearing Mishap
SSIR 19-18 Aircraft Bombing Mishap
SSIR 19-19 Practice Autorotation Mishap
SSIR 19-20 Aircraft Refueling Fire
SSIR 19-21 Weapons Elevator
SSIR 19-22 SPY-1D Radiating MSC Ship
SSIR 19-23 Aircraft Electrical Fire
SSIR 19-24 FLIR Turret Mishap
SSIR 19-25 Instrument Approach Mishap

All of these Lessons Learned and Sanitized SIRs are available on the "Lessons Learned" pages of the Naval Safety Center's CAC-enabled website. Directions for the Naval Safety Center CAC-enabled website and lessons learned page are as follows: https://intelshare.intelink.gov/sites/navsafe
1. New Users: Request access to the website.
2. Click the "Lessons Learned" icon on the main page (right side; looks like a chalkboard).
3. Under "Lessons Learned Communities", click the relevant community folder.
4. On each community page, click the desired "Lessons Learned Products" folder
5. Select the LL/SSIR of interest.

Leveraging you – Been there, done that? We encourage submission of your survival and near-mishap stories. To submit, email **NAVSAFECEN_CODE522_LESSONS_LEARNED@navy.mil.**

Media and Communication Products

Safety promotions provides a broad range of media and communication products.

Strategic Communication Messaging
Provides strategic communication messaging and support for safety innovations, initiatives, and programs with fleet-wide impact:
• 5100.23H Road Show
• Dive/Jump Reporting System

Internal and External Communication Products
Safety Promotions produces digital and hard copy versions of magazines, safety grams, and bulletins:
• *Approach*, *Mech*, and *RIDE* magazines
• Ship's Safety Bulletin – information tailored to the afloat surface community
• Factual Lines About Submarine Hazards (FLASH) – information tailored to the submarine community
• Aviation Safety Grams – relevant news and information tailored to specific type/model series

Leveraging you – We encourage magazine article submissions from the fleet.
To submit, email **NAVSAFECEN_CODE521_MEDIA_COMMS@navy.mil.**

Collaboration with Safety Partners and Allies

Collaboration with safety partners and allies across the Department of the Navy, across the services and with our allies globally:

• ASN E/IE
• FVEY
• UK Conference
• Joint LL

GLOSSARY

ASN E/IE	Assistant Secretary of the Navy for Energy, Installations and Environment
CAC	Common Access Card
CNA	Center for Naval Analysis
CNAF	Commander, Naval Air Forces
CPF	Commander, Pacific Fleet
DoD	Department of Defense
DOPT	Differential Operational Tempo
FFC	Fleet Forces Command
FVEY	Five Eyes
HFACS	Human Factors Analysis and Classification System
KMSP	Knowledge Management and Safety Promotions
LCI	Lower Confidence Interval
LL	Lessons Learned
NECC	Navy Expeditionary Combat Command
NSW	Naval Special Warfare Command
OPTEMPO	Operational Tempo
SSIR	Sanitized Safety Inspection Report
UCI	Upper Confidence Interval
UK	United Kingdom
USFF	United States Fleet Forces Command

NOTES:

AVIATION

DIRECTOR: **COL DAVID BUSSEL**
DEPUTY DIRECTOR: **MR. ADAM HYAMS**

AIRCRAFT OPERATIONS: **SAFE-CODE-11@NAVY.MIL**
AVIATION MAINTENANCE: **SAFE-CODE-12@NAVY.MIL**

The Aviation Directorate (Code 10) provides expertise and guidance in aviation operations, maintenance, mishap investigation, and aerospace medicine. The staff includes subject matter experts in all current fixed-wing and rotary-wing aircraft types and aviation maintenance specialties. Fleet outreach centers on a comprehensive system of safety assessments for squadrons and aviation facilities, as well as technical and policy guidance.

Class A and B *MISHAPS*

CLASS A & B

FY2019

Overall, Navy FY19 Class A and Class B Flight Mishaps (FMs) declined sharply, marking a six-year low for Class A FMs and reversing a four-year rising trend in Class B FMs. USN FY19 Class A Aviation Ground Mishaps (AGMs) remained static while Class B AGMs rose sharply.

USN FY19 Class A mishaps:

- During taxi, HH-60H's engaged rotors impacted a second H-60's rotors. Shrapnel damaged a third H-60.
- MH-60R crashed on takeoff from an aircraft carrier ~ no injuries to aircrew.
- F/A-18F: Aircraft malfunction resulting in loss of aircraft ~ pilot ejected safely.
- E-6B tail struck hangar during tow evolution.
- T-45C engine boll back and aircrew ejection on Short Final ~ no fatalities.
- F/A-18E impacted canyon wall during low altitude training ~ one fatality.
- While airborne, MH-60R Low Frequency Sonar Assembly departed the aircraft into the ocean.
- During a bolter, E-2D struck four F/A-18s on flight deck. Diverted safely. All okay.

Class A and B *MISHAPS*

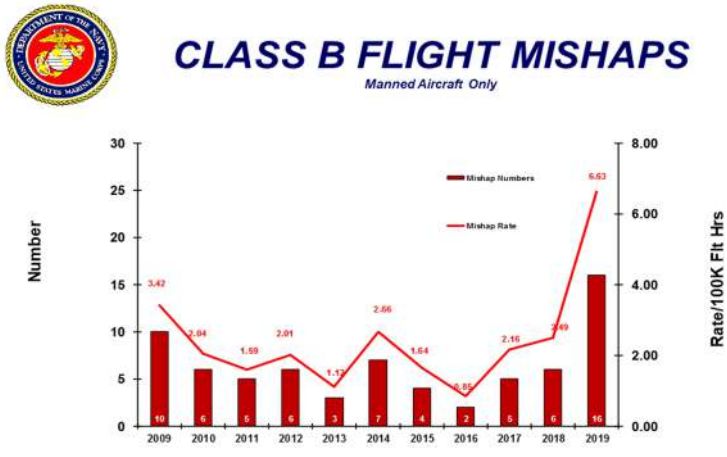
CLASS A & B

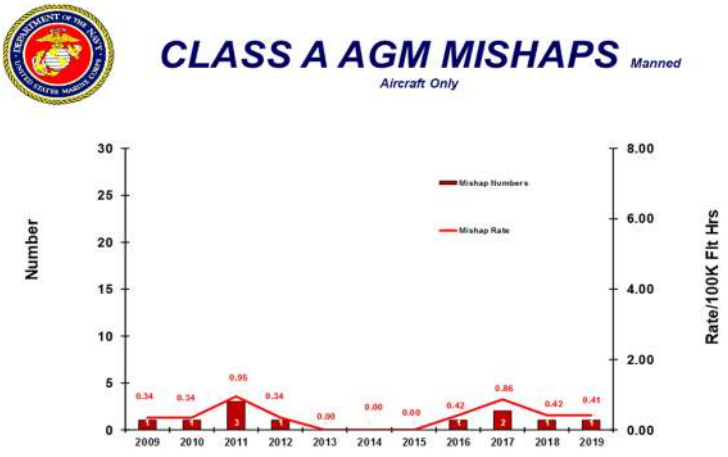
FY2019

Overall, Marine Corps FY19 Class A and Class B FMs rose sharply, especially for Class B FMs at a rate of 6.63 per 100K flight hours. Marine Corps FY19 Class A and B AGMs rose marginally.

USMC FY19 Class A mishaps:

- Midair collision of F/A-18D and KC-130J during night air-to-air refueling ~ six fatalities, one injured.
- CH-53E tail separated from fuselage after landing gear retracted during taxi.
- Two F/A-18Cs collided in midair while conducting CAS. Both aircraft landed safely, both pilots okay.
- AH-1Z impacted ground while conducting CAS ~ two fatalities.
- F/A-18D engine bay fire. Aircraft recovered to airfield ~ no injuries.
- F-35B ingested bird during takeoff roll, causing engine damage. Pilot safely aborted takeoff.
- During AV-8B functional check flight, pilot ejected while in the landing pattern due to systems failure resulting in complete AC loss. Pilot okay.
- CH-53E experienced a fire upon takeoff, no injuries.





CLASS C

Class C *MISHAPS* FY2019

For FY19 there were 173 (manned) USN Class C mishaps:
- 85 AGM (prominent airframes: 46 X F/A-18 variant, 14 X H-60);
- 85 FM (prominent airframes: 38 X F/A-18 variant, 16 X T-6/T-45, 14 X H-60);
- 3 flight related mishaps.

The rate of Class C mishaps plateaued in FY19, ending a seven-year rising trend. After significant attention was given to an ever-rising rate in Class C AGMs over the past two years, AGMs declined significantly. FY19 saw a significant rise in Class C FMs. The net result is a Class C mishap rate of 21 per 100K flight hours, virtually the same as FY18.

The overwhelming majority of Navy Class C AGMs (85 in FY19) are due to performance-based errors that occur during ground maintenance operations. Examples of performance-based errors include moving aircraft into objects or moving objects into the aircraft, dropping aircraft components, injuring personnel while conducting maintenance, and falling from aircraft.

The most discernable Navy Class C FM trends (85 in FY19) were that 13 occurred due to BASH-related damage, and 12 occurred due to lightning strikes or other adverse weather phenomena.

The opposite occurred in Marine Corps aviation: FY19 Marine Corps Class A and B mishap rates rose while the Class C mishap rate continued a two-year decline. Marine Corps leadership similarly placed significant emphasis on curbing Class C AGMs. Class C AGMs continued a sharp decline while Class FMs rose for a combined Class C mishap rate of 23.75 per 100K flight hours.

Common trends of USMC Class C AGMs (27 in FY19) are injuries sustained from falling off aircraft or other injuries while conducting maintenance, damage to aircraft during towing evolutions, and damage associated with rotor damper failure. USMC Class C FM (27 in FY19) common trends included eight TFOAs and aircraft component/systems failure. Only five Class C mishaps were BASH related.

For FY19, there were a total of 59 (manned) USN Class C mishaps:
- 27 AGM (prominent airframes: 11 X MV-22, 7 X CH-53E)
- 27 FM (prominent airframes: 8 X UH-1Y, 7 X F/A-18 variant, 7 X MV-22B)
- 3 flight related mishaps.

FY19 Trends in Aviation Facilities

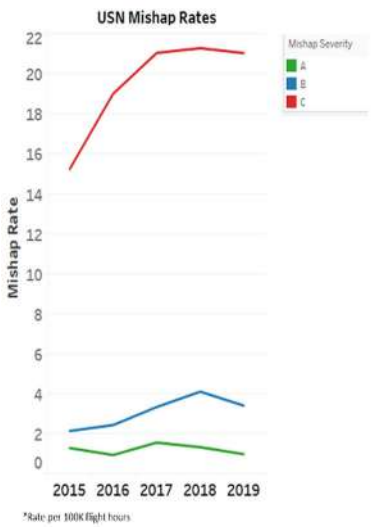
As noted in previous years, a constrained resource environment requires prioritization of funding across the Naval Aviation Enterprise (NAE). With a renewed focus on aircraft readiness, facilities and the maintenance required for those facilities continues to suffer.

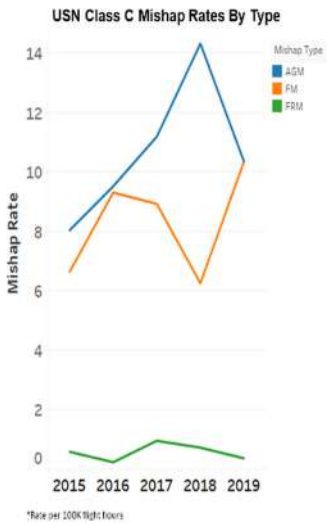
During numerous NAVSAFECEN safety assessments, the teams observed multiple fleet aviation units that routinely work in hangars that are deteriorating at naval airfields. The general habitability of hangars continues to be a common concern around the fleet with aging hangars that have quality of life and safety concerns (e.g., insulation falling from ceilings, leaking windows and roofs, inoperable pressurized air systems and missing ceiling tiles). Inoperable hangar doors continues to be a concern across facilities as well as Aqueous Film Forming Foam (AFFF) suppression systems and fire detection elements. AFFF outages are less widespread, but even one inoperable system drastically increases the risk of a serious incident.

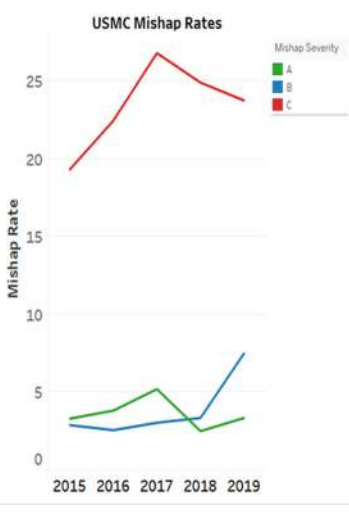
These preventable and fixable routine facility issues significantly elevate risk. Sailors and Marines, undeterred and resourceful in accomplishing their missions, find inventive ways to work around these enduring and hazardous facility issues. Despite their well-intentioned efforts to "just get the job done," in most cases, these "work arounds" violate safety policy, and place maintainers, aircrew, and aircraft in unmitigated and unnecessary risk situations outside of existing established procedural guidance.

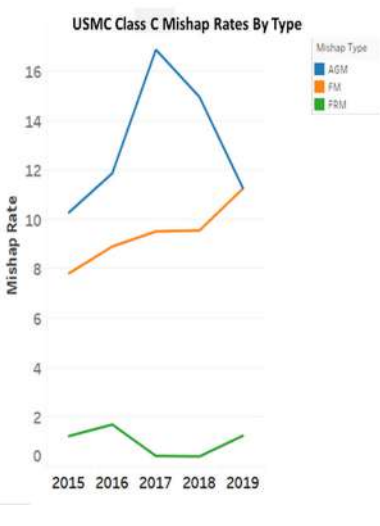
Understandably, infrastructure repair funding is not limitless and must compete with other high priority warfighting requirements. However, undeniably, repairing and operating Naval Aviation warfighting systems in degraded facilities without any risk visibility at the enterprise level masks threats to mission.

Squadron leadership must continue to aggressively identify facility shortcomings and report deficiencies to installation commanders. There is sure to be lag in the funding process, so in the interim, risk mitigation plans must be implemented to ensure that Sailors, Marines, and our warfighting assets are kept safe.







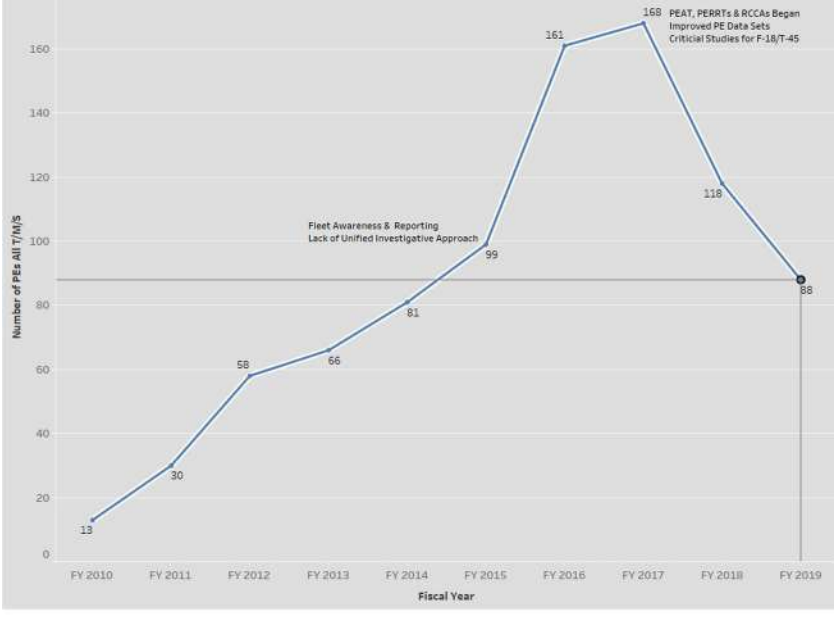


Physiological Events (PEs)

FY2019

In FY19, the number of PEs fell below the forecasted level (176) for the second straight year. The collective efforts across the NAE were effective in reducing the number of reported PEs to below FY15 crisis levels (99). If current trends continue, FY20 forecasting predicts a total of 100 PEs across all T/M/S for the coming year.

The NAE continues to invest considerable resources to understand and reduce PEs. With the writing of the PE Operating Guide in FY19 by the Aeromedical Division of NAVSAFECEN (Code 14), a comprehensive process was created which standardized the reporting and investigation of PEs on all applicable Naval Aviation platforms. This document codified the role of the Physiologic Event Rapid Response Teams (PERRTs), whose work across the NAE played a significant role in improving and standardizing data collection, assisting the F/A-18 and T-45 Root Cause and Corrective Action (RCCA) teams with PE root cause analysis and risk mitigation recommendations. In FY19, the PERRTs responded to, and thoroughly investigated, all 88 PEs and submitted over 325 lines of evidence used by NAE PE stakeholders for detailed aircraft and aeromedical analysis. The PERRTs were recognized by the SAFE Association for their contributions in the investigation and mitigation of PEs when they were awarded the 2019 Team Achievement Award. This award recognizes a fleet support team's outstanding contribution in the field of safety or survival through an advancement in the education, knowledge, science, application of investigative techniques, or engineering resulting in a significant improvement in safety or survival.



Efforts continue across multiple agencies to fully understand and communicate the human dimension of PEs.

The NAVSAFECEN Aeromedical Division supports multiple engineering and medical research organizations with PE data, including NAVAIR, the Navy and Marine Corps Public Health Center, Naval Aeromedical Research Unit-Dayton, Naval Aerospace Medicine Institute, and several other DoD medical research commands.

Improved fidelity of PE evidence collection, investigation with multiple entities providing concurrent analysis, and responsive leadership from squadron commanders to the CNO is making a difference.

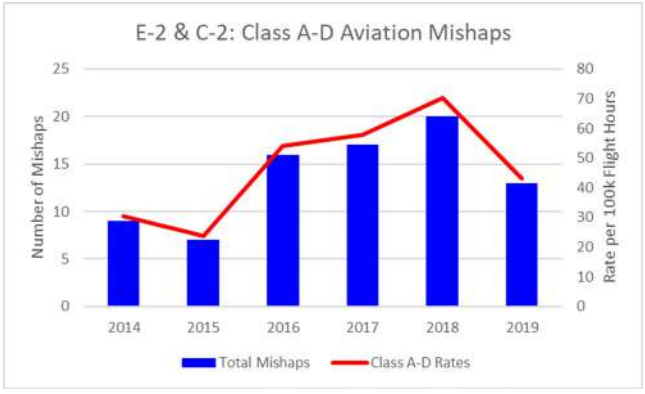
PERRTs investigated all 88 PEs and submitted over 325 lines of evidence.

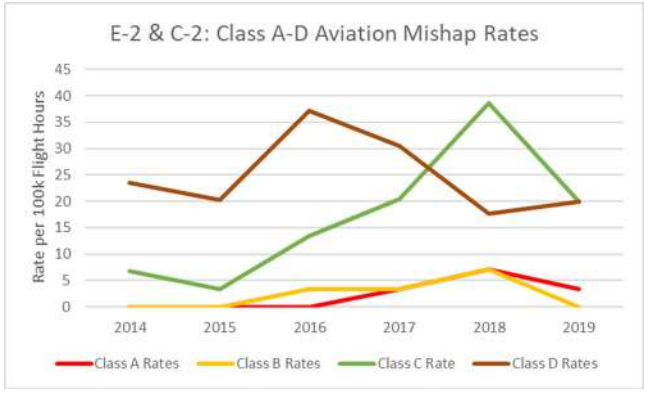
In FY19, the number of PEs fell below the forecasted level for the second straight year.

Aviation Analysis by Community

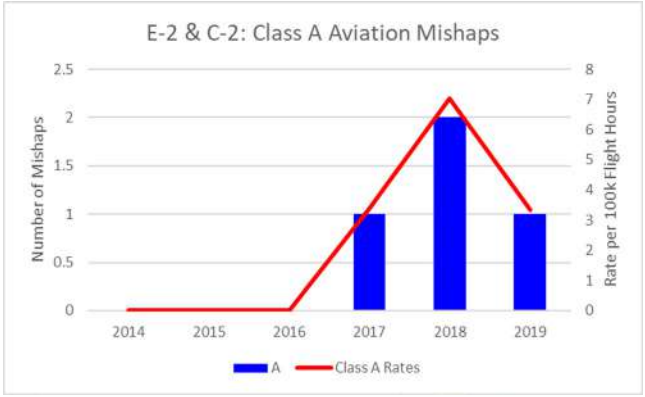
E-2 Hawkeye and C-2 Greyhound FY2019

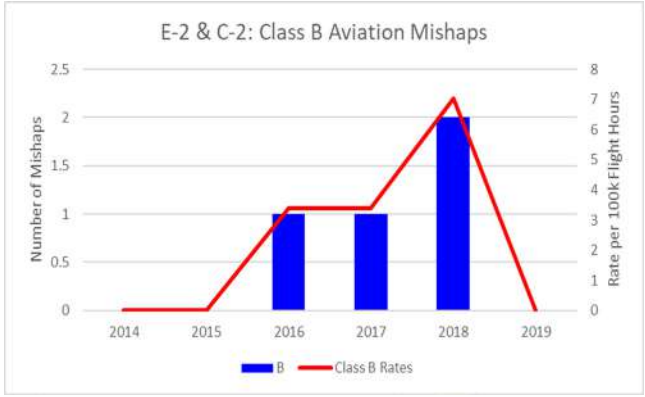
The Hawkeye and Greyhound communities recovered from a five-year high in mishaps in FY18 to a four-year low in FY19. The Hawkeye and Greyhound communities showed a decrease in mishap rates for Class A, B and C. There was a slight increase in Class D mishaps.

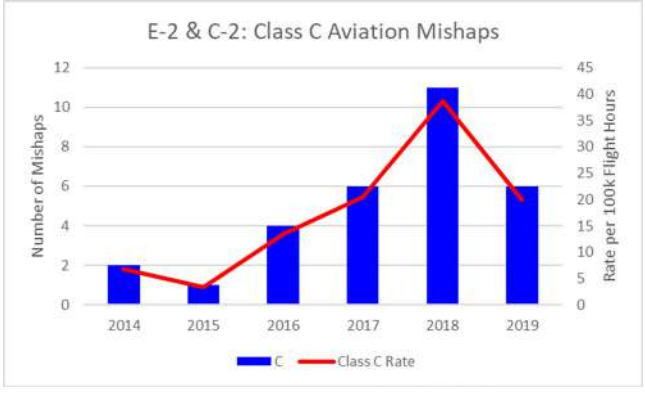


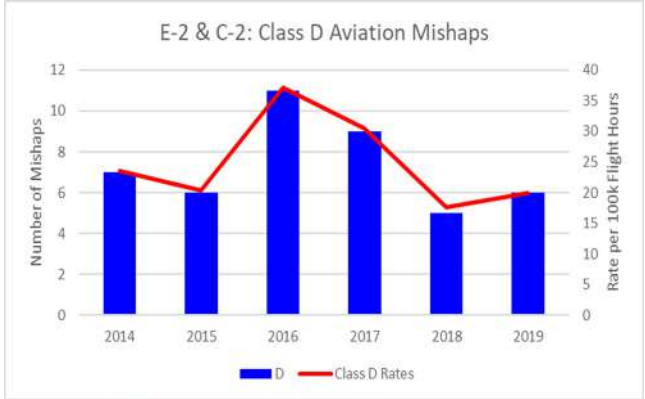


The Hawkeye and Greyhound communities reduced mishaps in Class A, B and C. There was one Class A, which occurred when an E-2D boltered and struck four F/A-18s. The aircraft diverted safety with no injuries to aircrew or flight deck personnel. There were no Class B mishaps reported in FY19. Class C mishaps were split between human and material factors. The overwhelming majority of Class D mishaps were a result of injuries while conducting maintenance.







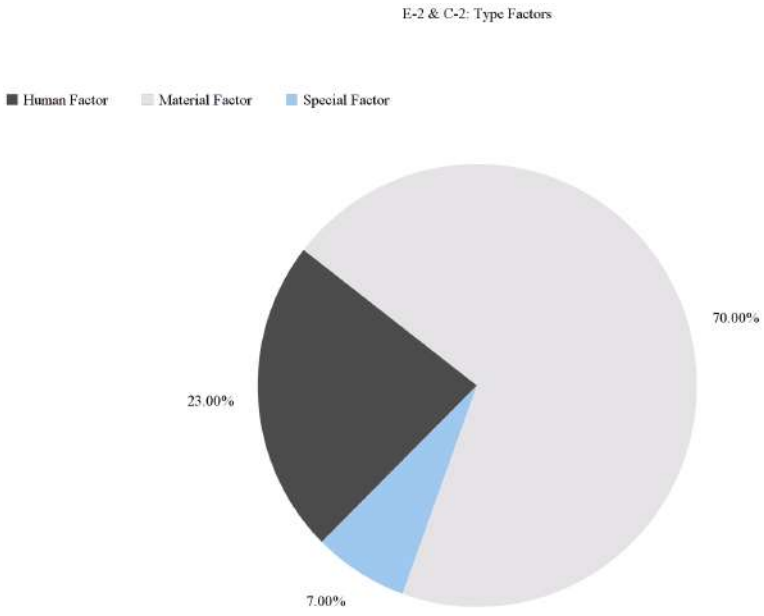


E-2 Hawkeye and C-2 Greyhound

FY2019

FY14 – FY19 mishap and HAZREP data shows that when the Hawkeye and Greyhound communities have a mishap or hazard event, material factors are cited overwhelmingly as the causal factors.

In FY19, the top five systems mentioned as material causal factors included propellers, unsafe landing gear, hydraulics, flaps, and tow-link. Human Factors accounted for 23 percent of causal factors in mishap or hazard reports, FY14 - FY19.



The leading human factor preconditions reported were:

State of mind
Complacency
Overconfidence

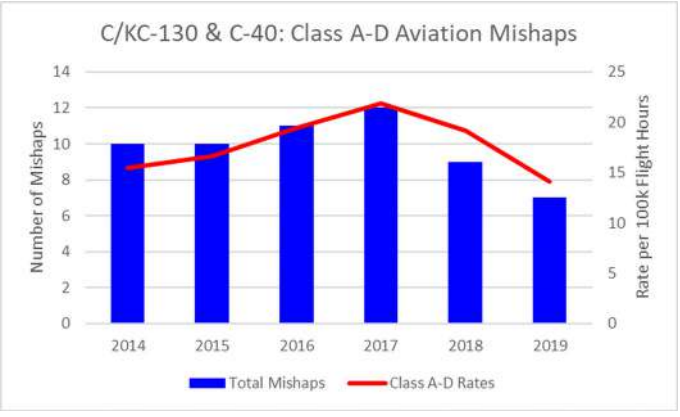
Break down in teamwork
Failure to effectively communicate
Critical information not communicated
Failure of crew/team leadership

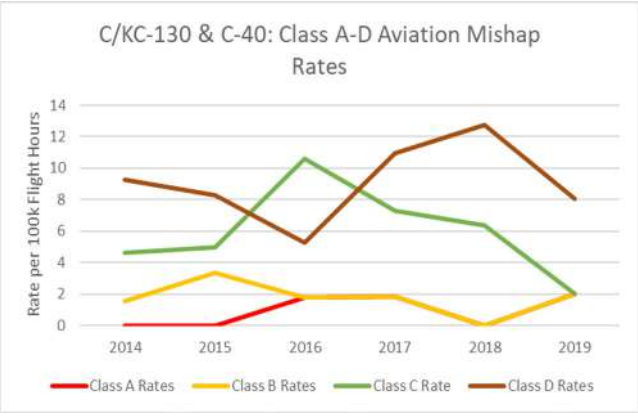
Inadequate Supervision
Failure to identify/correct risky or unsafe practices
Inadequate supervisory or command oversight
Failure to provide appropriate policy or guidance.

C-2A Greyhound Aircraft

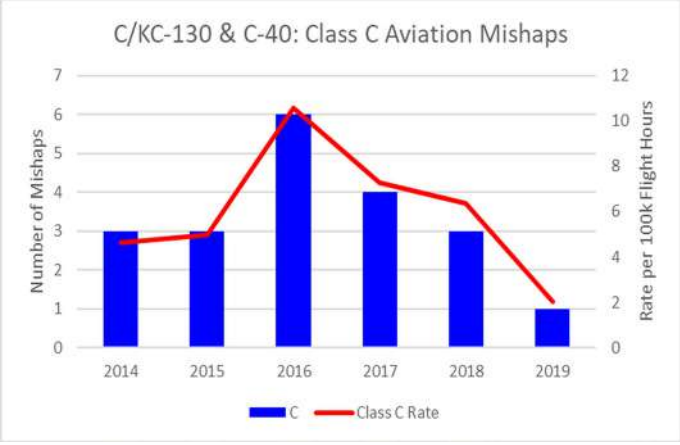
E-2 Hawkeye Aircraft

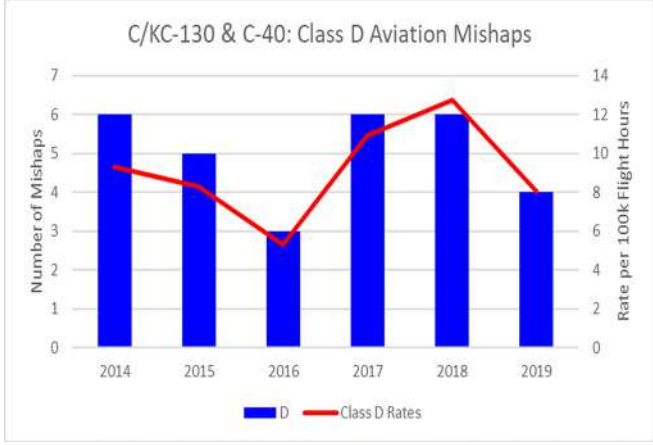
The Navy and Marine Corps C/KC-130s and C-40s that make up the Big Wing Cargo community continued a reduced mishap trend in FY19. The Skytrain community experienced zero mishaps involving C-40 aircraft in FY19.





With the exception of a Navy C-130T Class D mishap that suffered leading edge wing damage due to impact with a bird, all FY19 Big Wing Cargo mishaps involved Marine Corps KC-130Js. These events included one Class A mishap in which a KC-130J and crew were tragically lost in a midair collision with an F/A-18D during a nighttime aerial refueling mission over the Sea of Japan. The Class B mishap involved a KC-130J that suffered severe damage from hail in flight. In addition, there was one Class C and three Class D Marine KC-130J mishaps in FY19, a seven-year low for Class C mishaps, and a three-year low for Class D mishaps involving Naval C/KC-130s.





FY14-FY19 mishap and HAZREP data shows that when the Big Wing Cargo community has a mishap or hazard event, human factors are cited overwhelmingly as the causal factor.

Based on C/KC-130 and C-40 mishap and hazard reporting, the leading causal human factors preconditions were:
A breakdown in Teamwork
Critical information not communicated
Failure to effectively communicate
Failure of crew/team leadership
State of Mind
Complacency
Overconfidence

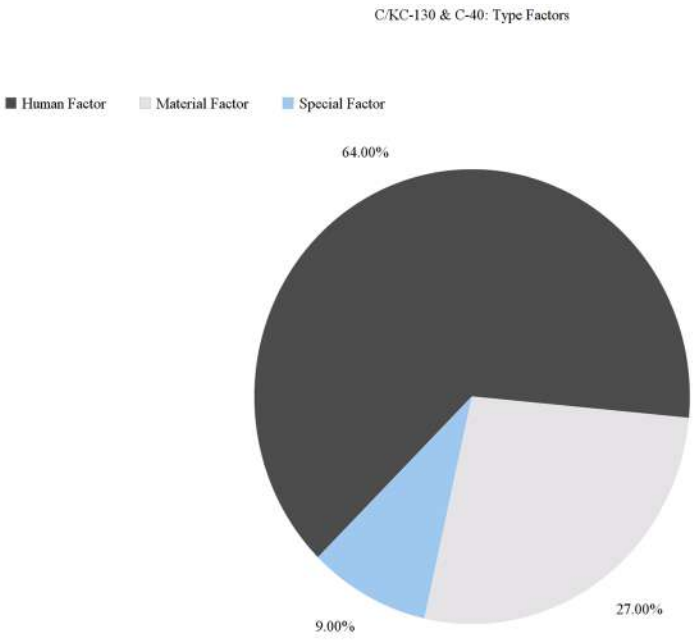
C/KC-130 Hercules and C-40 Skytrain (VR/VMGR) FY2019

The Big Wing Cargo community has a healthy hazard reporting culture. In FY19, C-40s reported 30 HAZREPs, 17 of which were BASH. Navy and Marine Corps C/KC-130 squadrons reported 70 HAZREPs, of which 17 were BASH-related. Though the legacy C/KC-130T fleet has been restored to operational status with installment of the new NP-2000 propeller system following a propeller Red Stripe that disrupted flight operations for much of FY18, the aging C/KC-130T airframe continues to suffer a growing trend of material failures.

Another disturbing FY19 trend is a significant increase in hazard reporting of aircraft maintenance errors that occurred while the aircraft was receiving depot-level and intermediate-level maintenance and rework. Many of these C/KC-130 discrepancies were found many months -- even years -- after the aircraft had been accepted as "Safe for Flight."

Most of these discrepancies were discovered accidentally during the conduct of unrelated maintenance at operational squadrons or as flight handling observations made by aircrew during flight. Many of these discrepancies could have resulted in catastrophic material failure.

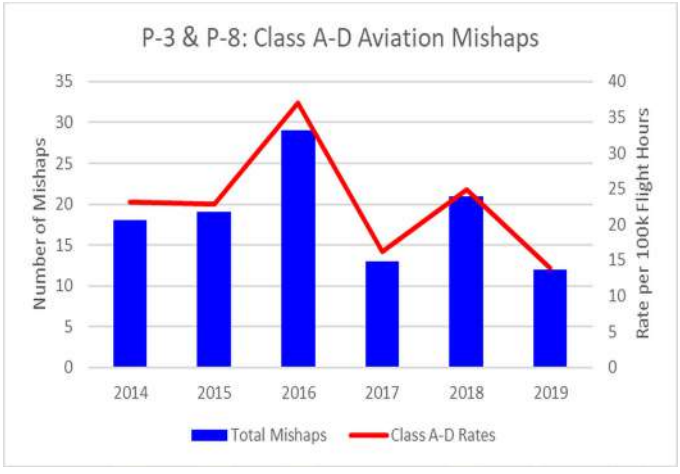
C130 Hercules Aircraft

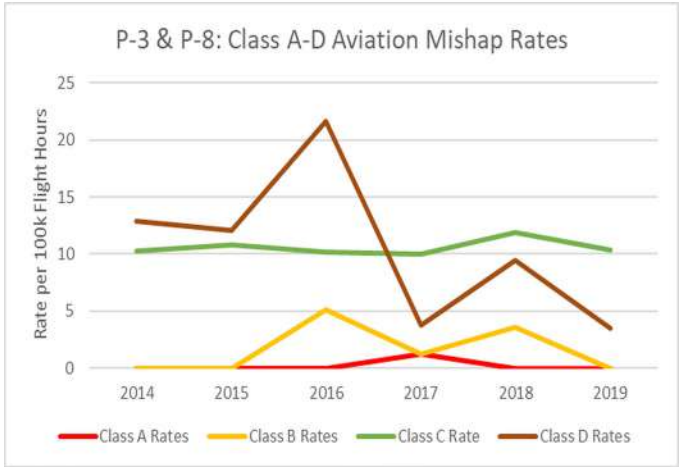


C-40 Skytrain Aircraft

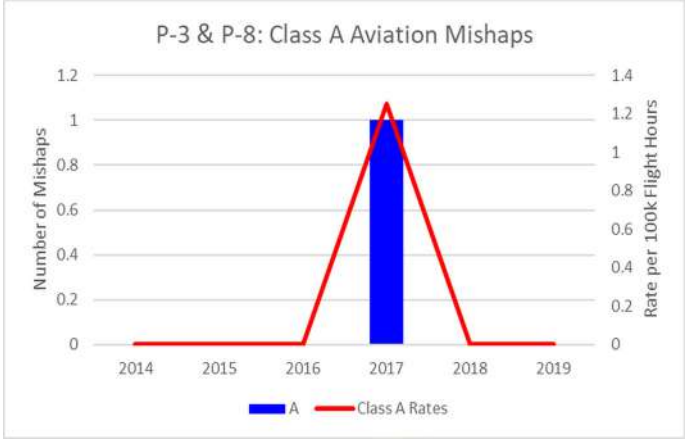
Maritime Patrol and Reconnaissance Aircraft (MPRA - P3C Orion, EP-3E Aries II, and P-8A Poseidon) FY2019

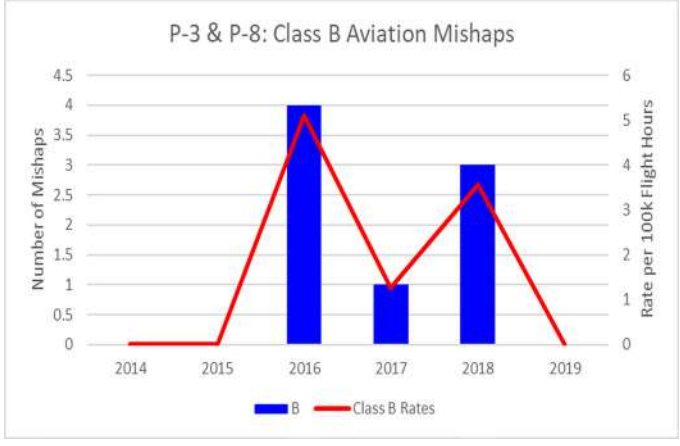
After an increase in mishaps in FY18, Maritime Patrol and Reconnaissance aircraft had a decrease in mishaps and mishap rates in FY19.

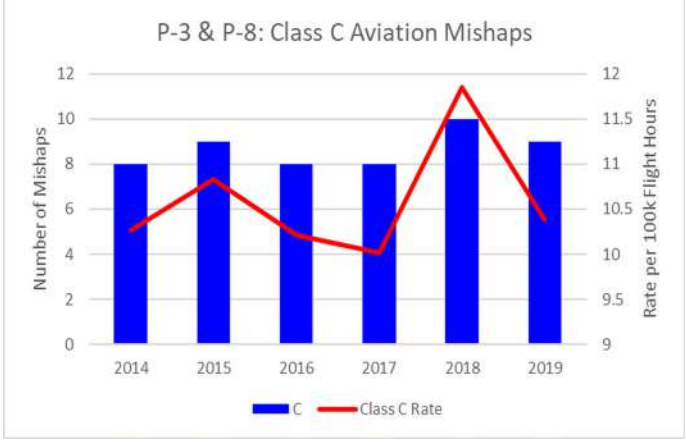


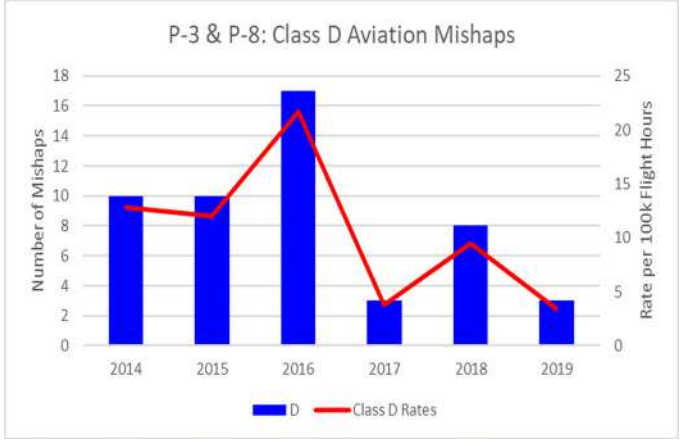


There were no Class A or Class B mishaps reported in FY19. Class C and Class D decreased. Injuries sustained during maintenance account for the most Class C mishaps with BASH also a factor. Two of three Class D mishaps were due to injuries sustained during maintenance.







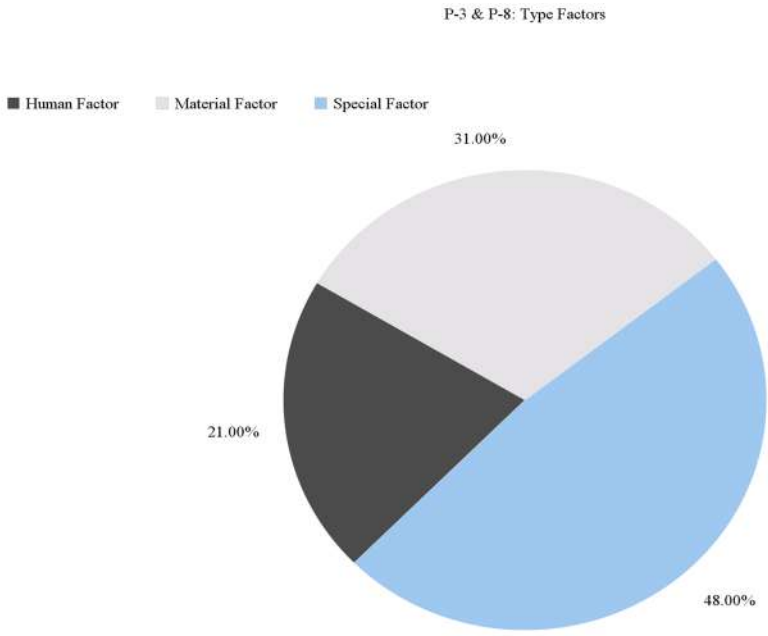


Maritime Patrol and Reconnaissance Aircraft (MPRA - P3C Orion, EP-3E Aries II, and P-8A Poseidon) FY2019

FY14 – FY19 mishap and HAZREP data shows that when Maritime Patrol and Reconnaissance aircraft have a mishap or hazard event, special factors are cited the most as causal.

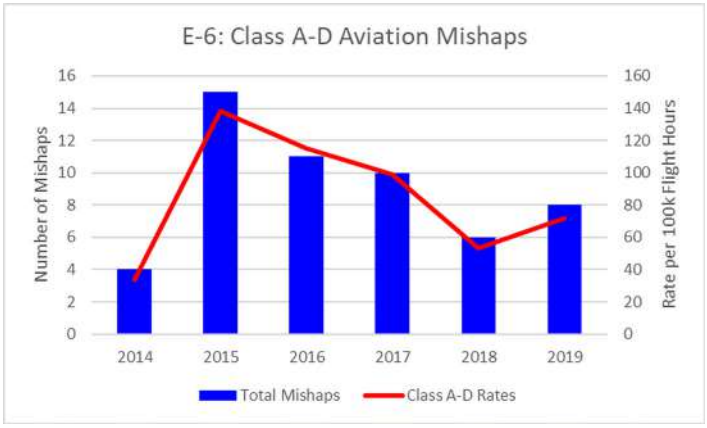
The primary report received from the P-3 and P-8 communities included BASH reports. Material factors accounted for 31 percent of mishap and hazard reports.

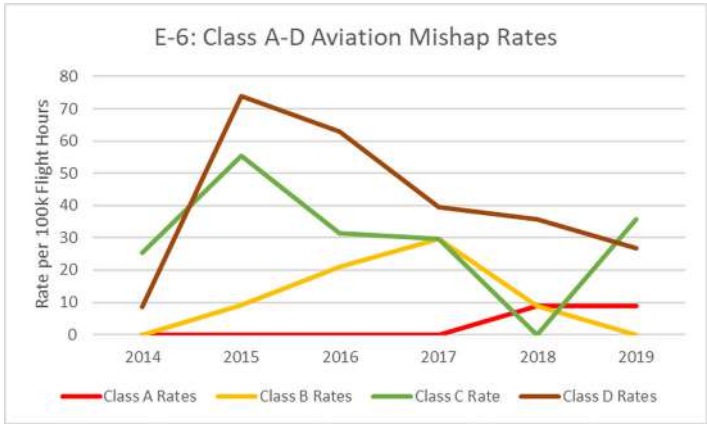
In FY19, the top systems mentioned as material causal factors included (primarily from P-3 aircraft):
Oil pressure, hydraulics and anti-ice.



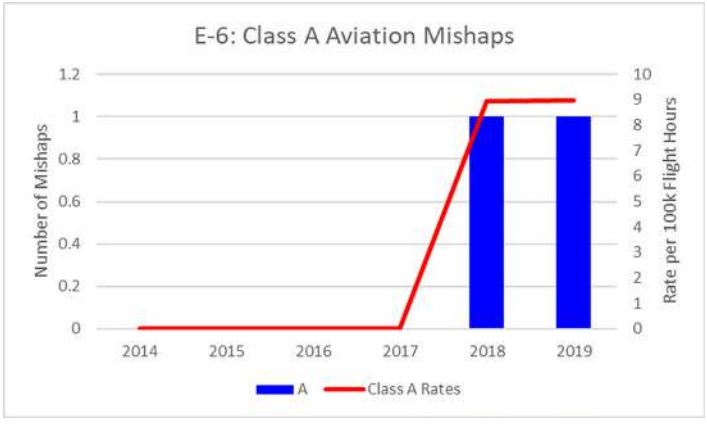
P-8A Poseidon Aircraft

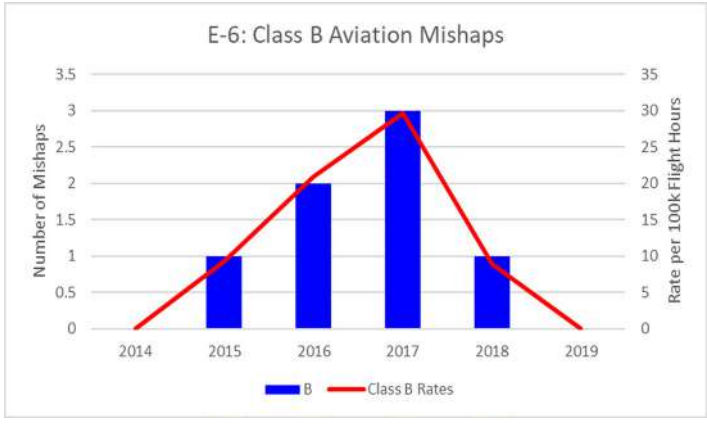
After a consistent decrease over the past four years, E-6B mishaps have risen slightly in FY19. With Class A, B and D mishap rates decreasing, there was a sharp increase in the Class C mishap rate in FY19.

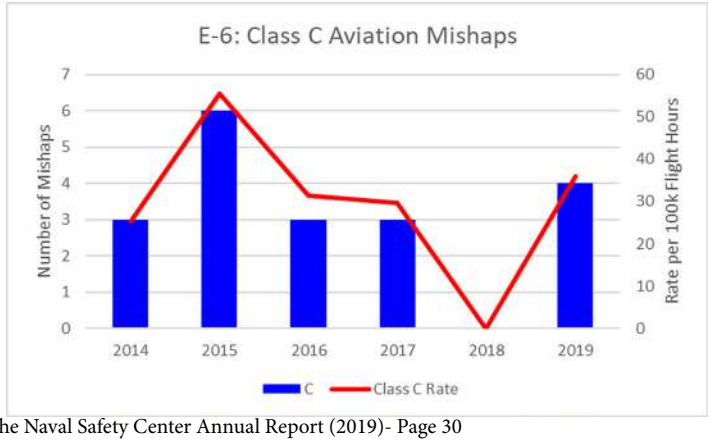


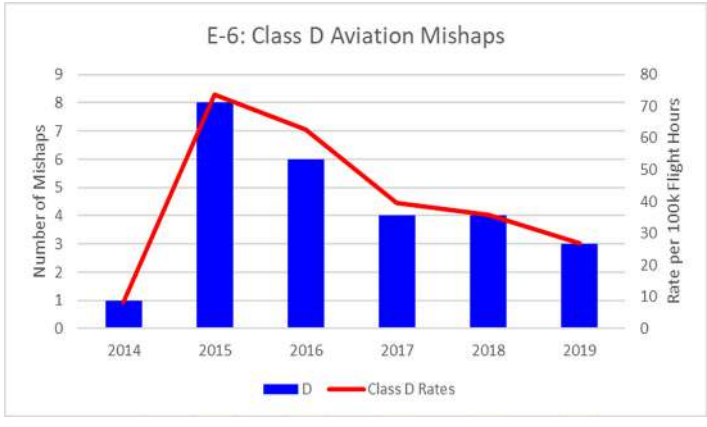


There was one Class A mishap in FY19: an E-6B aircraft tail striking the hangar during towing. There were no Class B mishaps reported in FY19. Most Class C and Class D mishaps were due to material issues with the following systems referenced: Air cycle machine, trailing wire antenna and cove lip door.





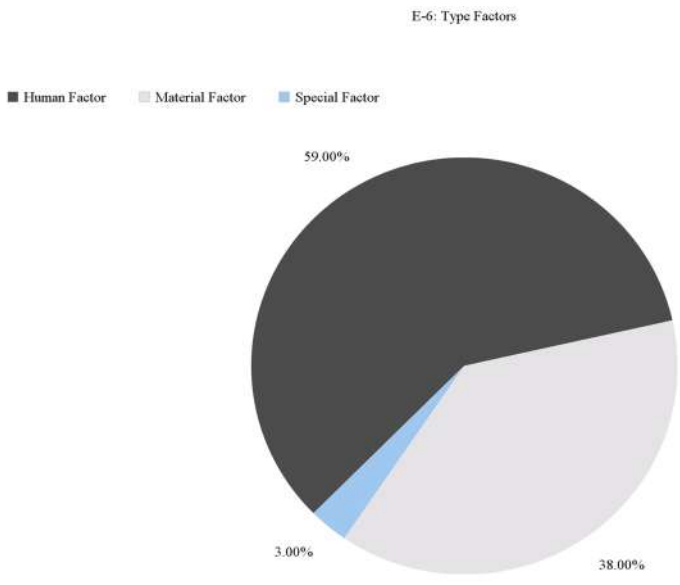




TACAMO (E-6B Mercury)

FY2019

E-6B Mercury Aircraft



FY14 – FY19 mishap and HAZREP data shows that when the Tacamo community has a mishap or hazard event, human factors are cited overwhelmingly as the causal factor.

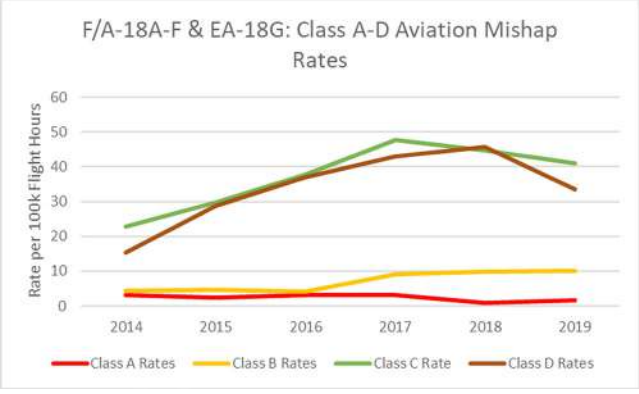
The leading human factor preconditions reported were:

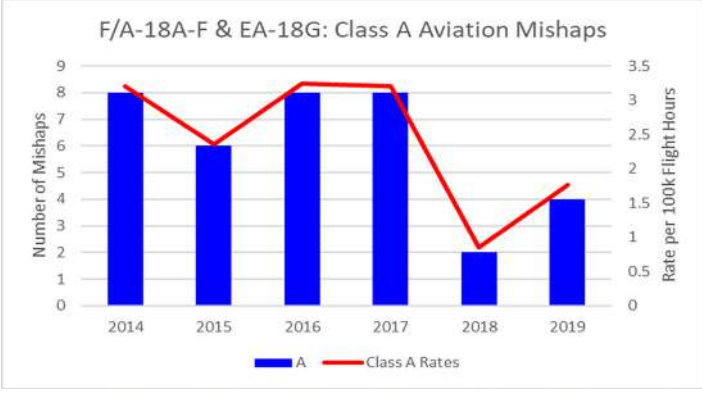
State of Mind
Complacency
Inadequate Supervision
Failure to provide appropriate policy/guidance
Failure to identify/correct risky or unsafe practices
Teamwork
Failure to effectively communicate

After a few years of a steady increase in mishap rates for the F/A-18A-F and EA-18G, the mishap rates have started a decreasing trend from FY17 to present, at approximately 80 mishaps per 100,000 flight hours during FY19.
While Class B rates stabilized in FY19, reporting indicates that the Class A mishap rate has slightly increased during FY19 and the Class C and Class D mishap rates have slightly decreased over the last two fiscal years.

Class C trends:
Maintainer injuries
Ground handling - Failure to follow procedures
Lightning strikes
Crunches
Engine fires

Class D trends:
Medical treatment beyond first aid following a PE
Maintainer injuries





The Class A mishap rate during FY19 showed a slight increase compared to FY18.
Despite the slight increase in FY19, the rate at which Class A mishaps occurred was half of that experienced during FY16 and FY17.

FY19 Class A mishaps included the following:
- Midair during aerial refueling and CAS holding
- Hydraulic system and switching valve failure
- Engine fire
- Controlled flight into terrain (CFIT)

The Class B mishap rate during FY19 showed a statistically significant increase compared to FY16, confirming an upward trend since FY16. The mishap rate from FY17 has remained constant through FY18 and FY19. FY19 Class B mishaps included:
- Engine FOD
- Crunches
- Ship-related collision, taxi/towing
- ENV/WX, lightning and earthquake

Human factors are cited as the cause of the majority of mishaps in the F/A-18A-F and EA-18G communities.

Analyzing the last five fiscal years reveals four predominant themes causal to most mishaps:

Teamwork
Failed to effectively communicate
Critical information not communicated
Crew/team leadership breakdown
State of mind
Complacency
Mental awareness
Not paying attention
Policy and process issues
Provided inadequate procedural guidance or publications

F/A-18A-F Hornet and EA-18G Growler

FY2019

An analysis of FY19 hazard reports indicates that the following represents hazards to the F/A-18A-F and EA-18G communities:

- BASH
- Environmental control systems (ECS), oxygen system malfunctions, PEs
- TFOA
- Generator failures
- Hydraulic leaks

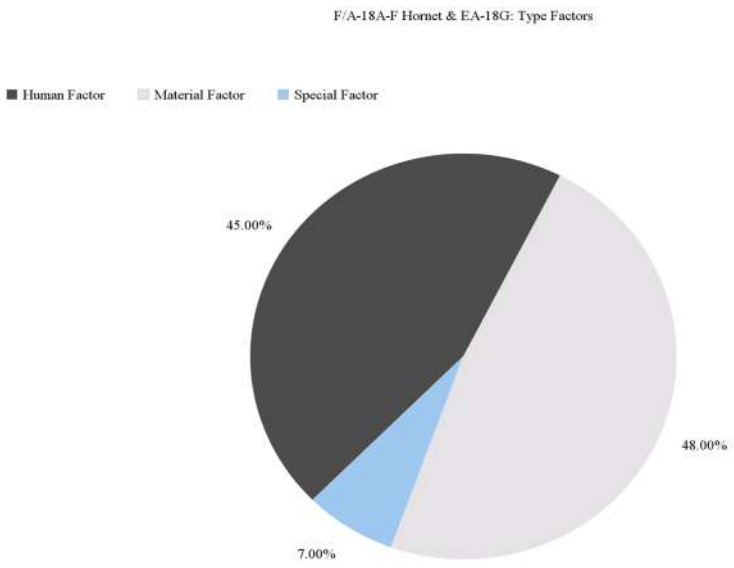
Incorporate team building into squadron aircrew and maintainer training with a focus on effective communication.

F/A-18E Hornet Aircraft

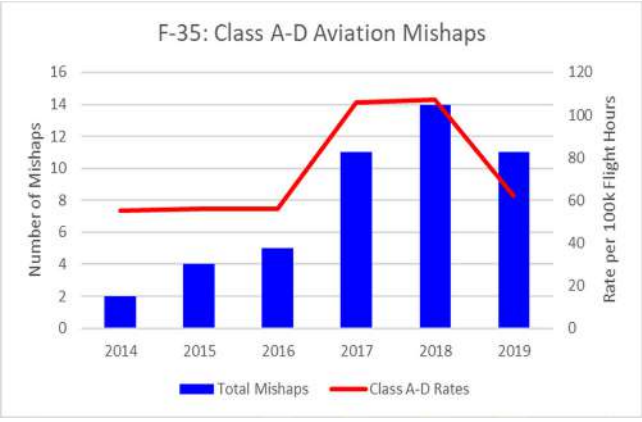
NAVAL SAFETY CENTER RECOMMENDED ACTIONS

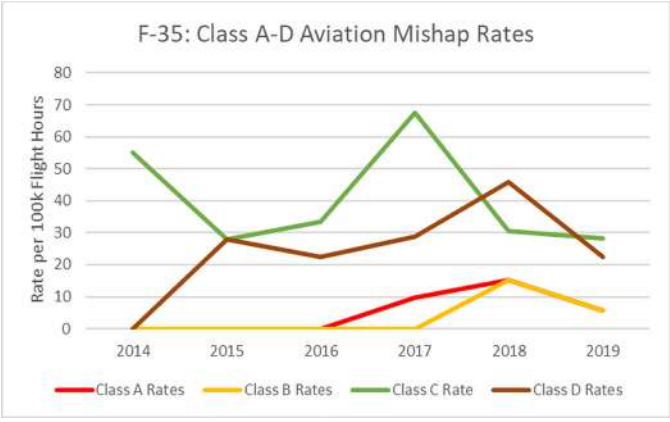
Counter the Class B mishap trend:
Review and determine squadron's Naval Aviation Maintenance Publication (NAMP) foreign object debris (FOD) program effectiveness.
Review processes for aircraft movement while ashore and embarked.

Reduce Human Factor related mishaps:
Incorporate team building into squadron aircrew and maintainer training with a focus on effective communication.
Emphasize proper by-the-book maintenance to mitigate the risk of complacency in the workplace.
Submit procedural changes where needed or for further clarification.

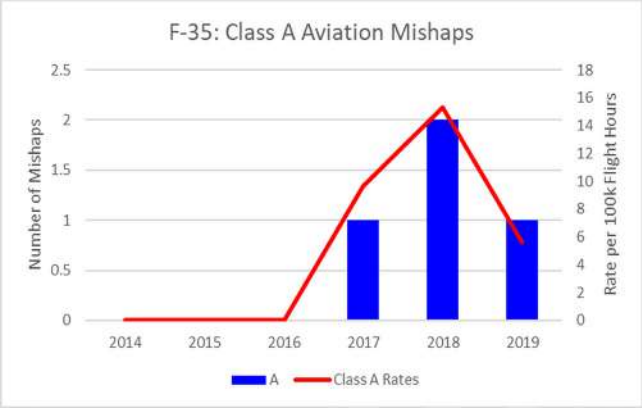


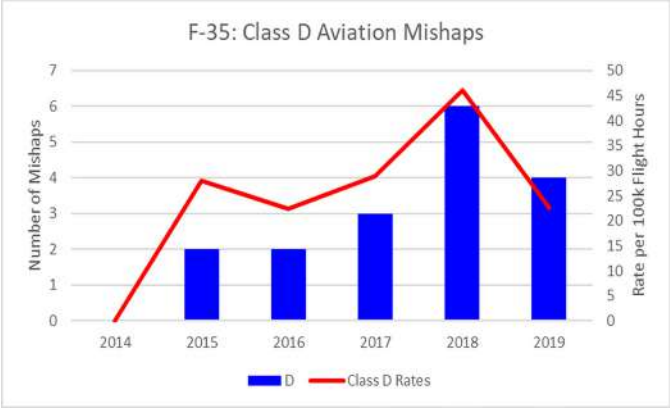
The F-35 Lightning community shows similar rates to that of the F/A-18 A-F and E/A-18 G community. The below graph shows a steady rise over the last five years, with a decline in FY19. We expect to see higher fidelity data as we continue to accept additional aircraft to the fleet and receive more incident HAZREPs and SIRs.





Every class showed a decrease from FY18, with the Class D reports as the sharpest decrease.
The FY18 Class A mishap was a loss of thrust and a FOD ingestion during aerial refueling. This past year, the F-35B/C community experienced one Class A event. An aircraft ingested a bird during takeoff roll.





FY19 Class B mishaps (one):
• Aqueous Film Forming Foam (AFFF) exposure to three aircraft
FY19 Class C mishaps (four):
• Lightning strike
• TFOA
• Hot brakes
• Damage during aborted takeoff

The Class D mishap rate during FY18 showed an increase from the previous year, but dropped during FY19. There were four reported events, two of which were PEs:
• PE (2)
• Structural damage during maintenance
• Ship-related towing

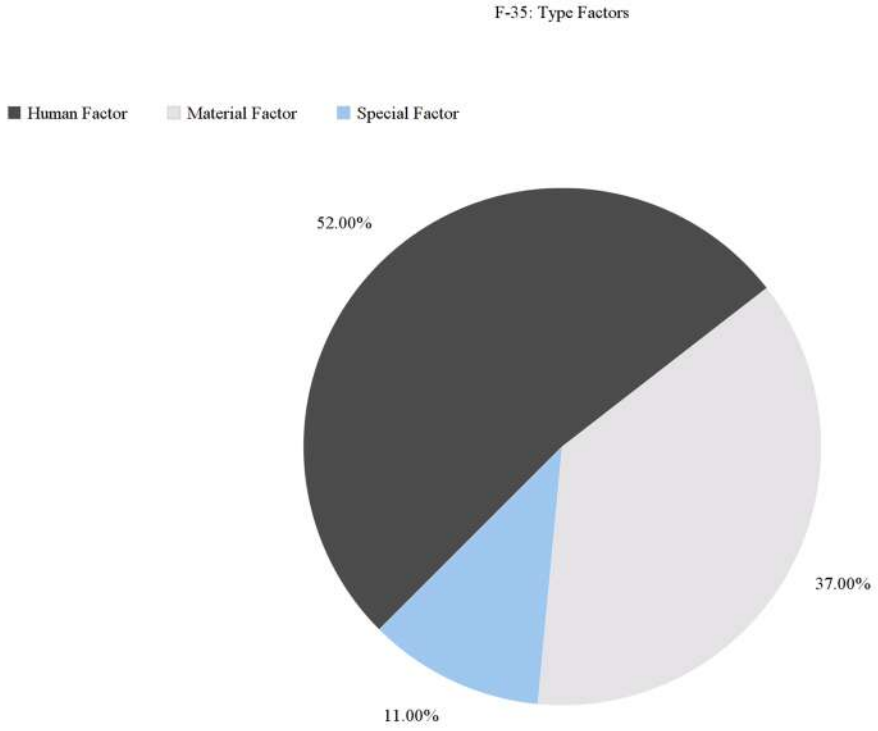
F-35 Lightning II

FY2019

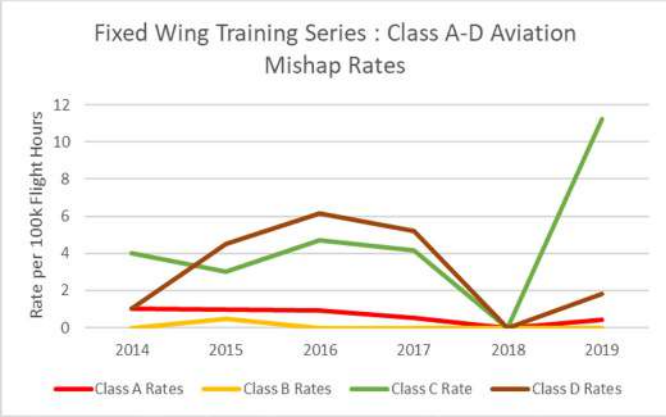
Human factors were cited as the cause of the majority of mishaps in the F-35 community.
When compared to other fixed wing tactical platforms, human factors were the highest percentage in the F-35 community:

State of Mind
Overconfidence
Teamwork
Critical information not communicated
Policy and Process issues
Provided inadequate procedural guidance or publications.

An analysis of FY19 HAZREPs indicates that the following represents hazards to the F-35 community:
• BASH
• Hydraulic failures (leak, line disconnect, cracked valve bracket)
• Engine FOD
• Lack of active inlet and exhaust debris monitoring systems
• Integrated power package (IPP) failure
• Recommend the following actions to continue reduction of mishap rates
• Review processes for aircraft movement while ashore and embarked
Similar to the F/A-18 community, recommend the following to reduce Human Factor related mishaps:
• Incorporate team building into squadron aircrew and maintainer training with a focus on effective communication.
• Submit procedural changes where needed or for further clarification.



The fixed wing training communities continued an incline in mishaps to a six-year high in FY19. With the exception of Class B mishaps, the mishap rate increased for all class mishaps. Most notable was a rapid increase in Class C mishaps in FY19. The number of Class C mishaps doubled, FY18 to FY19.



There was one fixed wing training community Class A mishap, which was due to a T-45C engine failure on short final with all crew safely ejecting. There were no Class B mishaps in FY19 while Class C mishaps showed a spike to 25 mishaps. The significant change was due to an increase from zero BASH incidents in FY18 to seven Class C BASH events in FY19.

FY14 – FY19 mishap and HAZREP data shows that when fixed wing training aircraft have a mishap or hazard event, material factors account for over 50 percent of the reports. In FY19, the top five systems mentioned as material causal factors included landing gear, tires, hydraulics, engines or compressors, and fuel pressure. Human factors accounted for 39 percent of causal factors in mishap and hazard reports FY14 - FY19.

The leading human factor preconditions were:

Mental Awareness
Fixation
Inaccurate expectations
Not paying attention
Confusion
Distraction
Confusion
Technical or procedural knowledge not retained after training

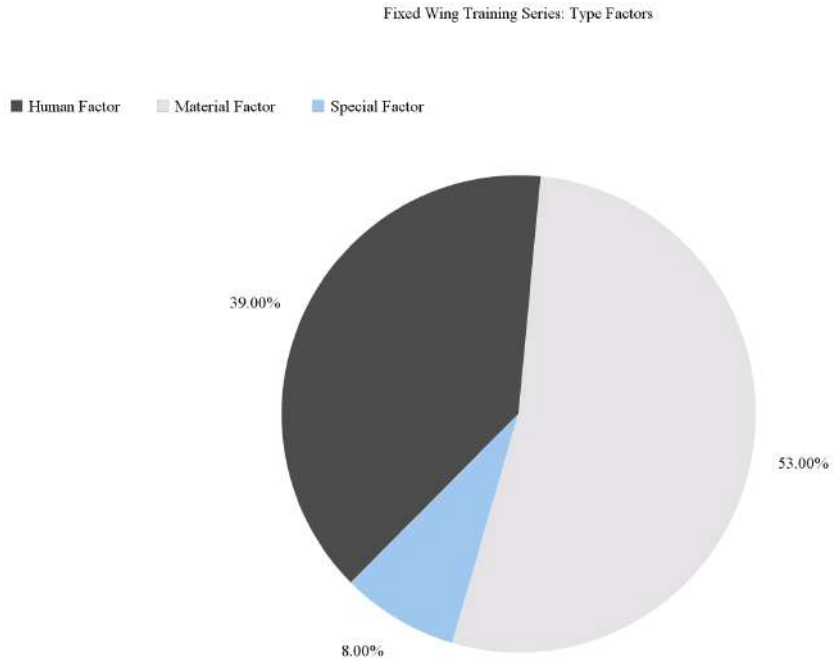
State of Mind
Complacency
Pressing
Overconfidence

Teamwork
Critical information not communicated
Failed to effectively communicate
Lack of assertiveness

Fixed Wing Training Series FY2019

There were no Class B mishaps in FY19, while Class C mishaps showed a spike to 25 mishaps.

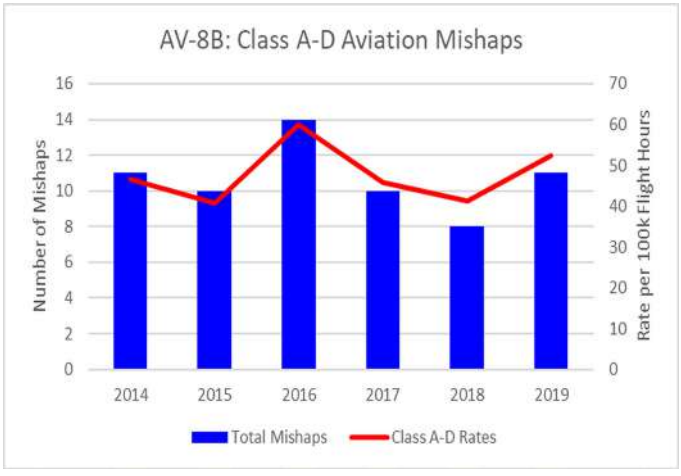
Human factors accounted for 39 % of causal factors in mishap and hazard reports FY14 - FY19.

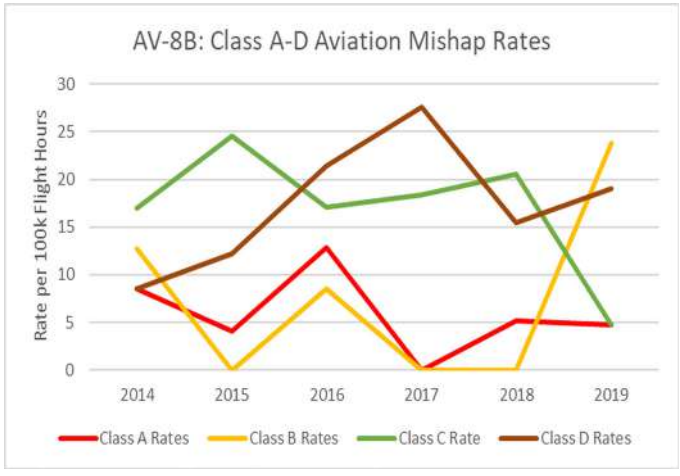


AV-8B Harrier

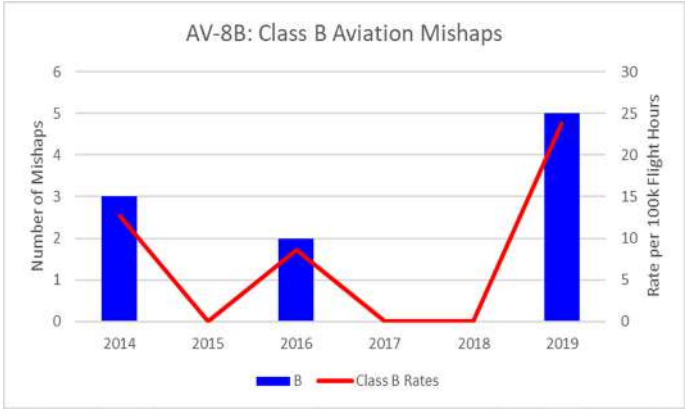
FY2019

Overall, the AV-8B community saw a significant rise in mishaps during FY19, especially for Class B mishaps. In the previous two fiscal years, there were zero Class B mishaps; in FY19, there were five. The one Class A mishap was the result of a material failure during a maintenance functional check flight that compelled the pilot to eject.





Class B mishaps inclined sharply, from zero in FY18 to five in FY19. Four of the five Class B mishaps were engine damage from ingesting FOD (ranging from an intake rivet and ice to a refueling grounding strap). Damage resulting from a brake fire after an aborted takeoff resulted in the fifth.



The good news story was a significant decline in AV-8B Class C mishaps. The only FY19 Class C mishap was due to a canopy explosion during a low altitude tactics flight, an 11-year low.
Despite multiple service-life extensions to the aging Harrier, FY14-FY19 AV-8B mishap data shows human factors are overwhelmingly the root cause of mishap causal factors.

AV-8B Harrier

FY2019

Based on mishap reporting, AV-8B leading causal mishap human factor preconditions are:

- Breakdown in teamwork
- Failure of crew/team leadership
- Task/mission planning/briefing inadequate
- State of Mind
- Complacency
- Overconfidence

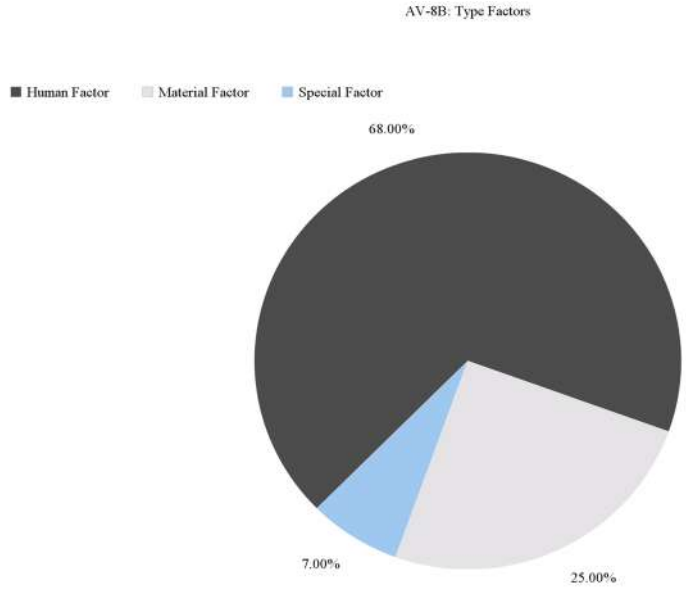
AV-8B Harrier II Aircraft

Hazard reporting in the AV-8B community has been historically low.

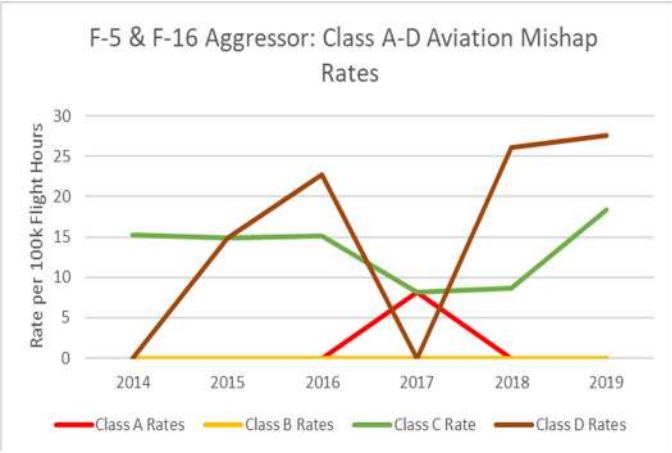
That culture has improved. Rather than reporting only near misses that occurred, the community is proactive and reporting hazards that could occur if left unmitigated.

Of the 19 AV-8B FY19 HAZREPS, nine were PE or oxygen system related and four were the result of BASH events.

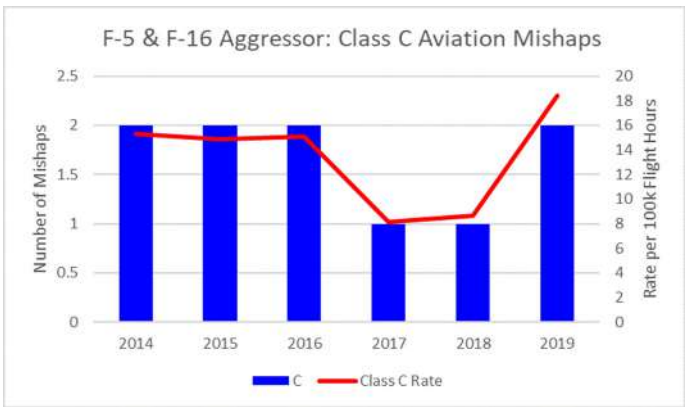
The remaining six were reports of unsafe acts and conditions ranging from contract maintenance malpractice to hazards aboard ship.



The Aggressor community had no Class A or B mishaps in FY19. The Class C mishap rates rose FY18 - FY19. With very few data points, this trend may seem misleading. The only Class C mishap occurred when a shop cloth was ingested in the motor during a high-power turn, and the Class D mishaps were all FOD related when rivet heads detached from the engine intake and were subsequently ingested, occurring in three separate aircraft.



Of four total FY19 mishaps, three involved FOD due to a material failure, and the other involved FOD attributed to human error. Hazard reporting in the Aggressor community is scarce, understandably so with such a small community. Only 26 hazard reports were released by the community for the fiscal year, seven of which were TFOA reports. Other HAZREPs include multiple airspace violations. The associated system failures were reports of a main landing gear door rod separating, binding controls, loss of pressurization, and uncommanded oscillations.

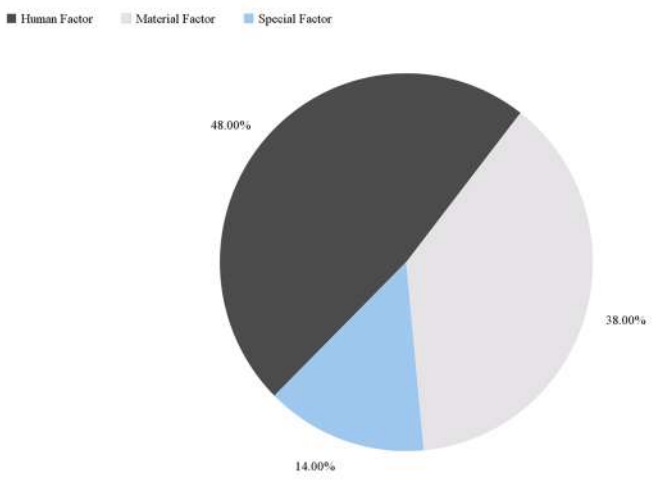


During airfield operations, there was a tail strike during a landing flare and a drag chute caught on a taxiway edge lighting after clearing the runway.

In addition, the community noted a lack of sufficient SAR assets at Naval Air Station Key West.

Finally, the community experienced aircraft damage during a maintenance, FOD of unknown origin, a fuel truck running into a parked aircraft and a near midair with civilian traffic.

F-5 and F-16 Aggressor: Type Factors



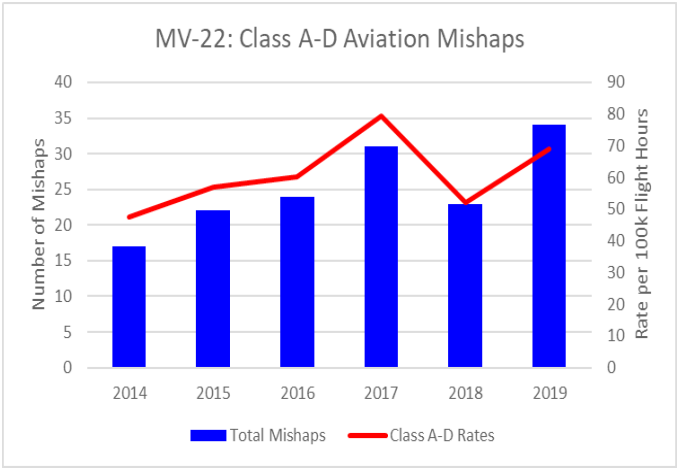
MV-22 Osprey

FY2019

FY19 marks the second year in a row with no Class A mishaps in the community. The community reported 34 mishaps, including two Class B, 21 Class C, and 11 Class D mishaps in FY18. The mishap rate increased over FY19 due to the increase in class C and D mishaps. Class C mishaps have increased by 20 percent and Class D mishaps have nearly tripled. Of these Class C and D mishaps, the most common causes were click stud disbanding and Blade Fold Wing Stow (BFWS) operations.

Human factors were the leading cause for all mishaps. Based on mishap reporting, MV-22B leading mishap causal factor preconditions were:

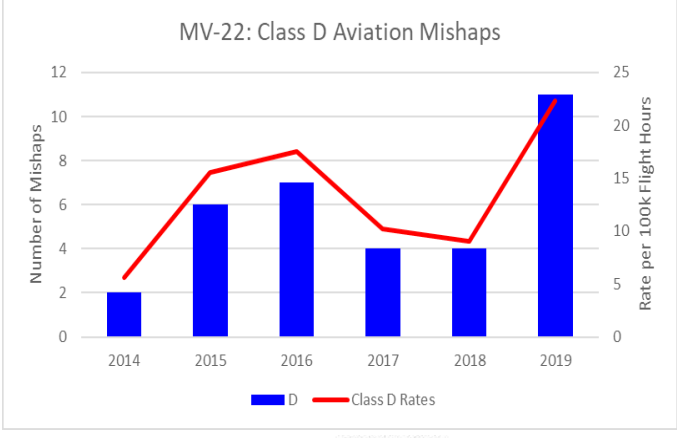
Teamwork
Critical information not communicated
Failed to effectively communicate
Failure of crew/team leadership
State of Mind
Complacency
Overconfidence
Pressing
Policy & Process Issues
Provided inadequate procedural guidance or publications
Purchasing or providing poorly designed or unsuitable equipment
Organizational (formal) training inadequate or unavailable
Mental Awareness
Inaccurate expectations
Not paying attention
Distraction

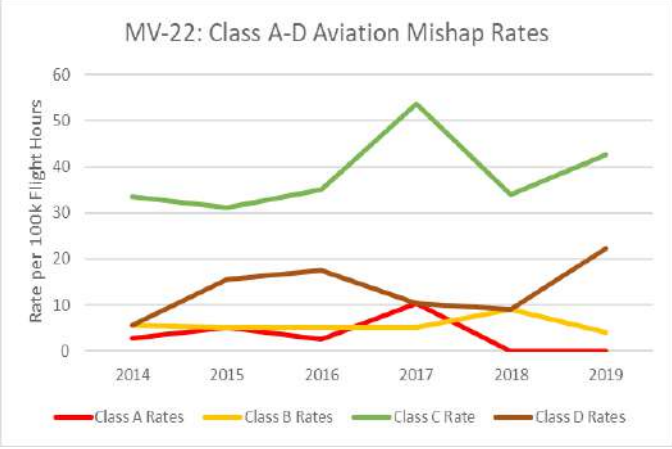


These are all factors that CRM or ORM, when used properly, can prevent. Whether flying or maintaining aircraft, you are never alone. When flying, there is a crew, and when performing maintenance, there are supervisors and inspectors who should be present during the task to act as checks and balances in the process to break the mishap chain.

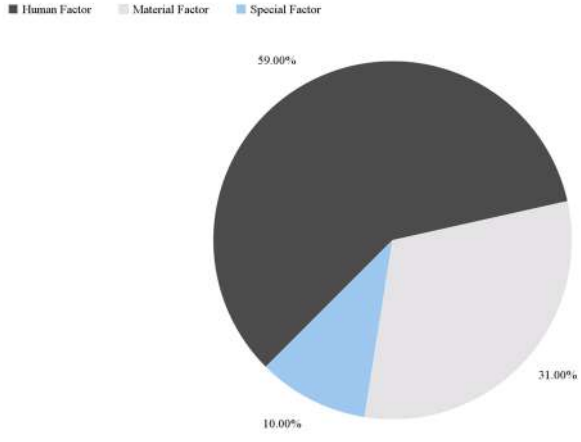
The MV-22 community has reported 52 HAZREPs for FY19; the trends include:
- BASH
- TFOA (blade fairing leading cause)
- Unauthorized Laser Events (ULE)
- Click Studs
- BFWS

FY19 marks the second year in a row with no Class A mishaps in the community.

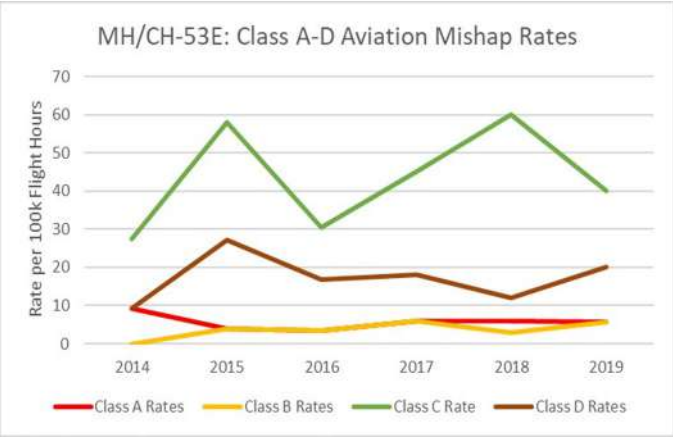




MV-22: Type Factors



The Navy and Marine Corps MH/CH-53E community reported 25 mishaps in FY19 including two Class A, two Class B, 14 Class C, and seven Class D -- two less mishaps than FY18 but still high. The Marine Corps CH-53E community experienced two Class A mishaps consisting of tail separating from fuselage after landing gear retracted during taxi and a fire on takeoff, as well as two Class B mishaps involving an aircraft catching fire during hover checks and main rotor damper failure in flight.



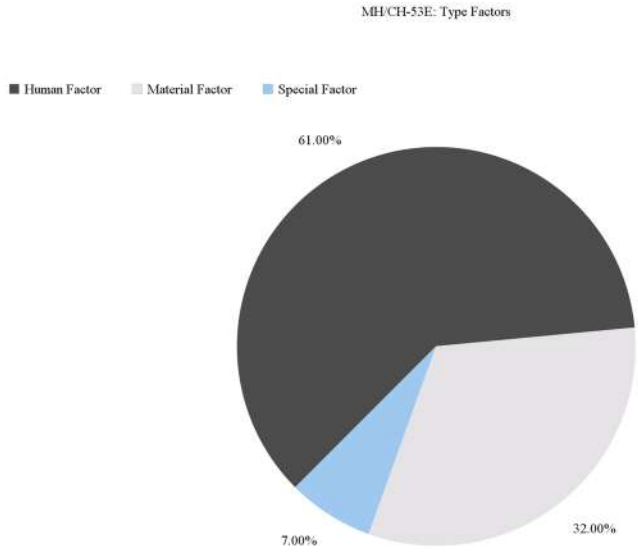
In the Class C and D categories, two notable trends were five damper failures and four injuries from falling from the aircraft.

FY 19 HAZREP trends included the following:

- TFOA
- BASH
- Crazed/pitted windshield
- MFCD modification has degraded the FLIR image
- ULE
- Damper failure

Last year's MH/CH-53E SSWG came up with a top 10 list for both platforms and several of their concerns show up in this FY's mishaps and HAZREPs. Of note, on the CH53 list were number six – FLIR image degradation on SMFCD, number seven – main rotor damper failures, and number nine – falling off aircraft.

The overall rate of mishaps is on a three-year high per 100,000 flight hours. Class C mishaps have declined the past fiscal year and Class D mishaps have increased. Total flight hours for the MH/CH53E have been on the rise from 25,800 hours to 34,900 hours over the past five years. Marine CH-53 squadrons are continuing to use the HAZREP process to document issues, trends, and get information to the fleet with a two-year stint in the 50 HAZREPs club. Navy H-53 squadrons are on a downward trend -- from 16 in FY17 to eight in FY18 and five in FY19.



There were 281 human factors, 150 material factors, and 34 special factors found causal in FY19 events.

That means 61 percent of all listed causal factors were human error.

MH/CH-53E Sea Dragon/Stallion

FY2019

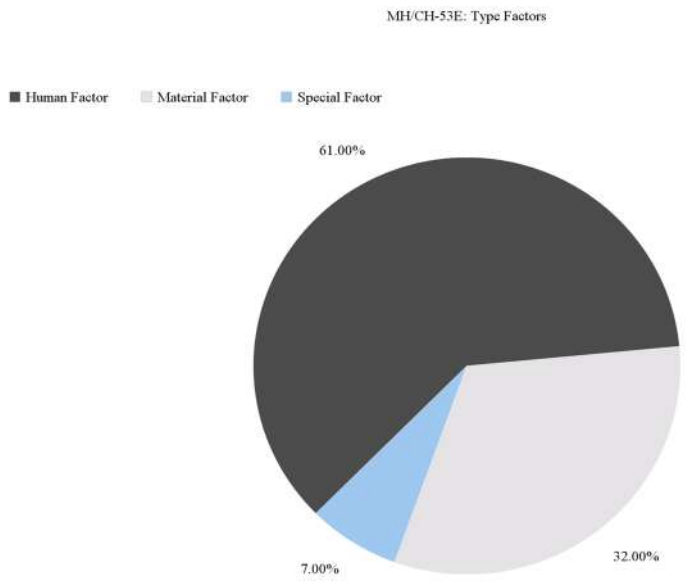
Based on mishap reporting from FY14-FY19, the 53 community's leading causal mishap human factor preconditions were:

A breakdown in teamwork
Critical information not communicated
Failed to effectively communicate
Failure of crew/team leadership
Lack of assertiveness
Task/mission planning/briefing inadequate

State of Mind
Complacency
Overconfidence

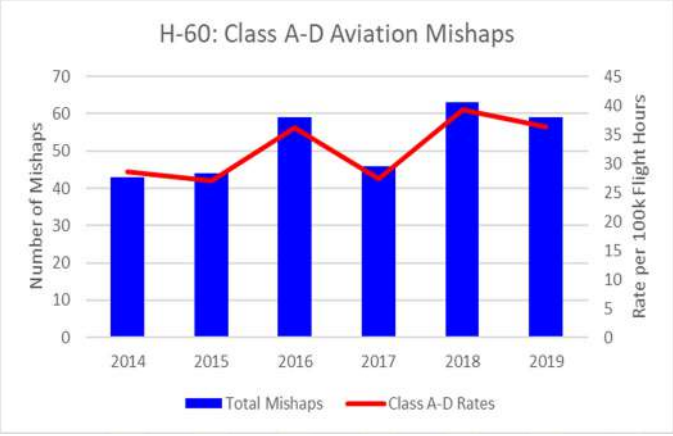
Supervisory Causes
Failed to identify/correct risky or unsafe practices
Performed inadequate risk assessment and/or mitigation – formal
Allowed unwritten policies to become standard

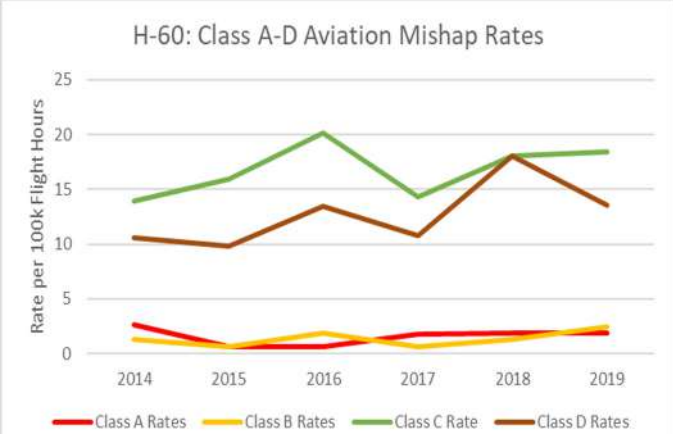
Organizational Influences
Provide inadequate procedural guidance or publications



MH-53E Sea Dragon
Helicopter

Overall, H-60 mishaps were down by six percent in FY19 from FY18 and overall mishap rates were comparable to FY16 mishap rates. A 24 percent decrease in Class D mishaps from FY18 to FY19 helped reduce the FY19 overall mishap number and rate when compared to FY18. For Class C and D mishaps, failure to follow procedure and lack of supervision were cited overwhelmingly as causal human factors.





The H-60 community experienced three Class A mishaps in FY19. Of these mishaps, one MH-60R transducer-related Class A mishap was reported, while material factors were noted as causal to the loss of a transducer. The second Class A mishap involved an MH-60R crashing on takeoff from a carrier (human as well as material factors were cited as causal). The third Class A mishap reported in FY19 involved an HH-60H aircraft impacting a second HH-60H aircraft during taxi, causing damage to both aircraft as well as a third static HH-60H aircraft. Human factors were noted as causal in this mishap.

The H-60 community reported four FY19 Class B mishaps. FY19 Class C mishaps remained constant when compared to FY18 Class C mishaps. Class D mishaps decreased from 29 in FY18 to 22 in FY19.

Human factors constitute the bulk of H-60 mishap causal factors.

Based on mishap reporting from FY14-FY19, the H-60 community's leading causal factor preconditions are:

Mental awareness
Not paying attention
Fixation
Inaccurate expectations

A breakdown in teamwork
Critical information not being communicated
Failed to effectively communicate
Failure of crew/team leadership
Task/mission planning/briefing inadequate

State of mind
Complacency
Overconfidence
Inaccurate expectations

Supervisory causes
Failed to effectively communicate
Failed to provide appropriate policy/guidance
Failed to identify/correct risky or unsafe practices

Organizational Influences
Provide inadequate procedural guidance or publications

Notable operations in the MH-60R community that have resulted in generation of numerous HAZRECs and MISRECs include ALFS operations, engine exceedances/malfunctions (FCF -- operations have been most commonly noted), ground maintenance operations, inadvertent external jettisons, CAD activations, TFOA, and shipboard aircraft handling operations.

H-60 Seahawk

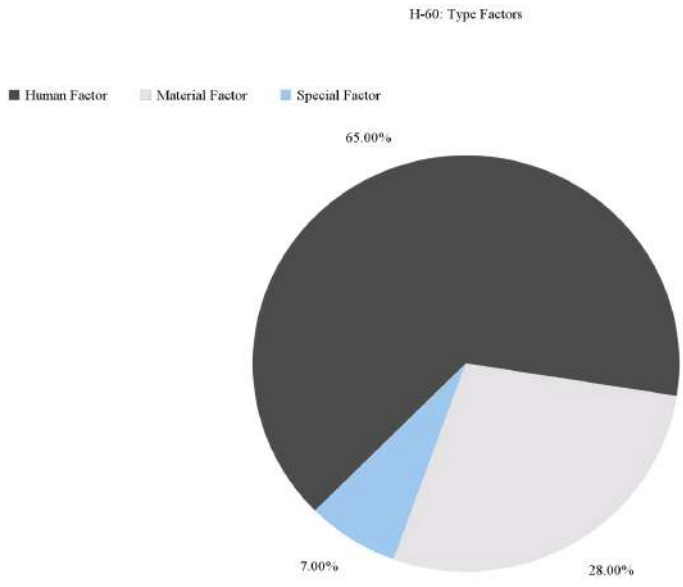
FY2019

Notable operations in the MH-60S community that have resulted in generation of numerous HAZRECs/MISRECs include: Degraded Visual Environment (DVE) operations, aircraft handling/taxi, inadvertent Jettison/CAD activation/TFOA, short haul HRST operations, and tail strut collapse.

In FY19, the H-60 community reported 4 Class B mishaps.

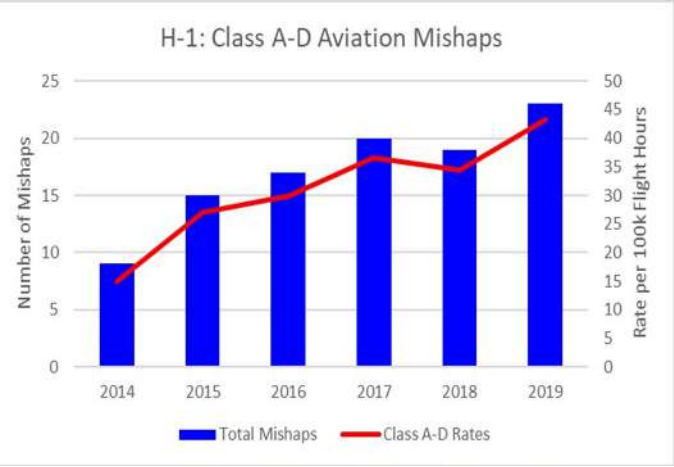
FY19 Class C reported 29 mishaps.

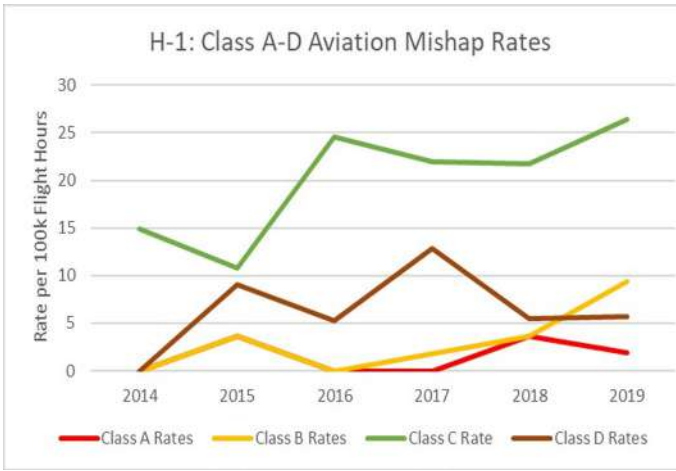
Class D mishaps decreased from 29 in FY18 to 22 in FY19.



MH-60R Seahawk Helicopter

Overall, the H-1 mishap rate increased in FY19, however, Class A mishaps were reduced by half with a steep rise in Class B and C. The Class A mishap and five Class B mishaps in FY19 were evenly split between AH and UH. FY19 Class C mishaps rose marginally. Of 14 FY19 Class C mishaps, five were ground and nine involved flight. H-1 Class D mishaps remained constant in FY19. All three Class D mishaps in FY19 were AGMs compared to two flight and one ground in FY18.





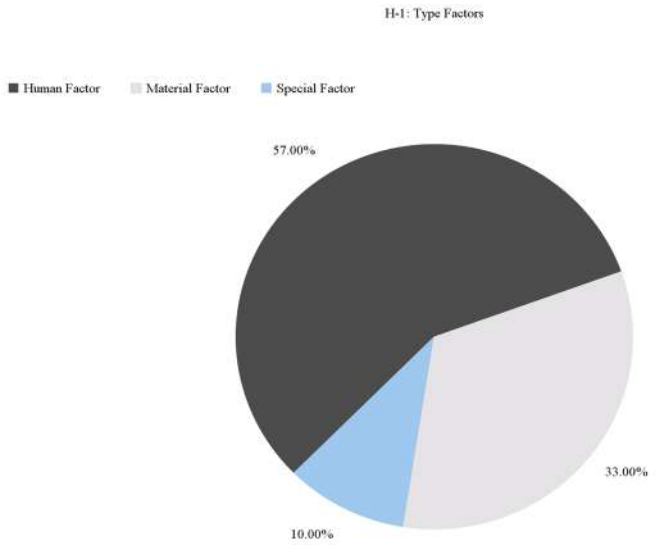
The H-1 community is comprised of new aircraft variants and aside from design issues, the material health of the H-1 community is strong, with all active squadrons now transitioned from legacy aircraft.

Based on mishap reporting from FY15-FY19, the H-1 community's leading causal mishap human factor preconditions are:

Complacency
Not paying attention
Fixation

A breakdown in teamwork
Critical information not communicated
Inadequate task delegation
Task/mission planning/briefing inadequate

Mental awareness
State of mind
Overconfidence
Pressing



FY19 Hazard reporting is slightly below the five-year average of 57.6 reports per FY and maintains a balance between UH and AH reporting consistent with current aircraft distribution.

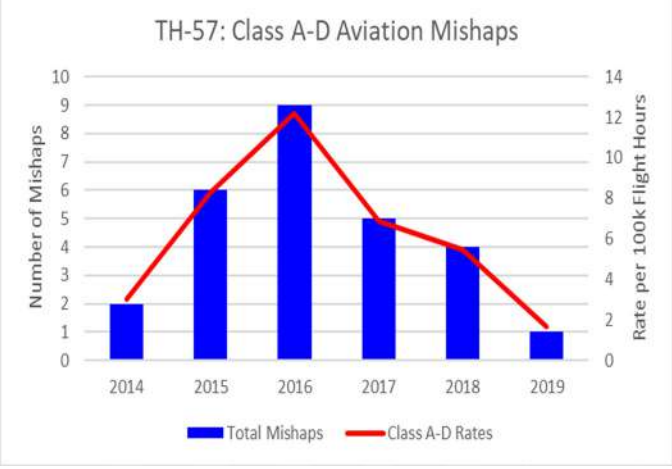
H-1 community FY19 HAZREP trends included:
- BASH
- TFOA
- ULE
- Various maintenance issues
- NMAC

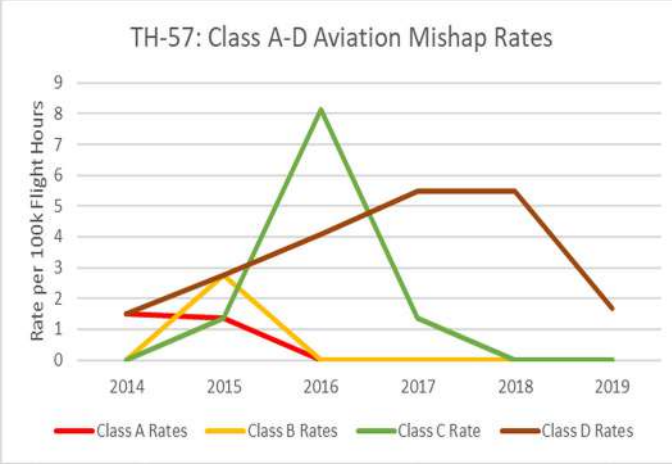
AH-1Z Cobra
Helicopter

TH-57B/C

FY2019

The Navy and Marine Corps helicopter training aircraft, TH-57, has seen a reduction in reported A-D mishaps for the past five fiscal years. The TH-57B/C cost of $3.3 million leads to minimal possibility to have a higher threshold mishap. The TH-57 has not had a class A or B mishap since FY15. Class C and D rates have reduced as well over the past five years, but hit a spike in FY18 at four. In FY19 there was only one TH-57 mishap – a class D. This figure is potentially not accurate as TH-57s have had numerous truck backs (any sort of potential maintenance action such as a hot start or aircraft engine over torque). CNATRA accounts for nearly one truck back per flying day.

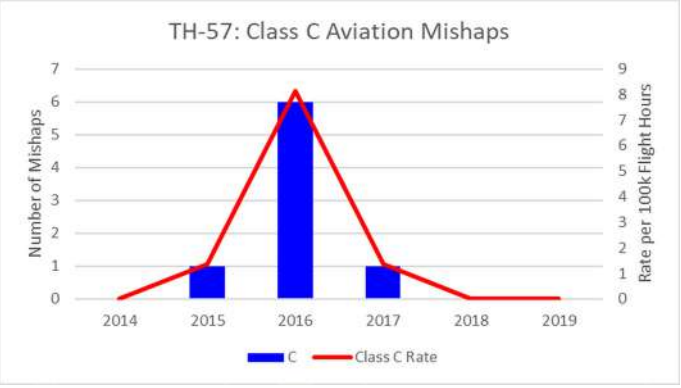




FY14-FY19 mishap and HAZREP data shows that when the TH-57 community has a mishap or hazard event, human factors are cited overwhelmingly as the causal factors.

Based on TH-57B/C mishap and hazard reporting, the leading causal human factors preconditions are as follows:

A break down in teamwork
Failure to effectively communicate
State of mind
Complacency
Inaccurate expectation



TH-57B
Helicopter

The TH-57B/C cost of $3.3 million leads to a minimal possibility of having a higher threshold mishap. The TH-57 has not had a class A or B mishap since FY15.

Unmanned Aircraft Systems (UAS)

Unmanned Aircraft Systems (UAS)

FY2019

MQ-4C
Unmanned Aircraft System

The Navy and Marine Corps Unmanned Aircraft Systems have seen an increasing number of mishaps over FY19 even though there have been reduced flight hours compared to manned aircraft. Troubles tend to be in the human-machine interface, unexpected aircraft altitude deviations or turns, and damage during aircraft recovery with non-traditional runway landing systems.

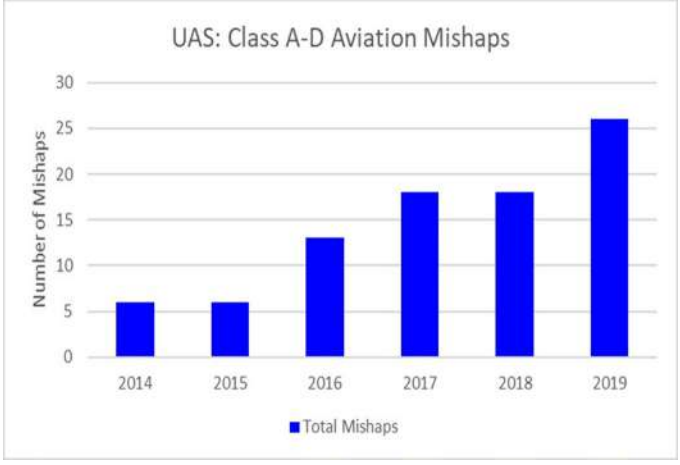
The **RQ-21A Blackjack** continues to have the most UAS flight mishaps compared to other T/M/S in the Naval inventory. This is attributed to minimal redundant systems leading to loss of link or problems in aircraft propulsion.

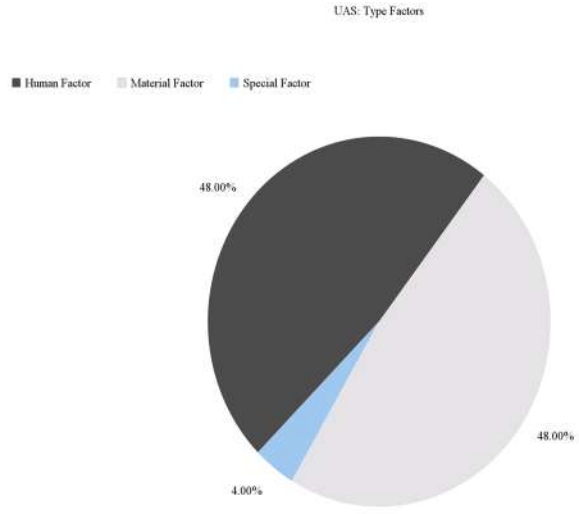
The **RQ** has ditched at sea more than any other aircraft in the Naval inventory during the last five fiscal years. Often it was recovered by small boats around an LPD ship. More complex payload systems will increase the RQ-21A cost to nearly $2.5 million in the next few fiscal years. It is anticipated that the RQ-21A will continue to crash between 400-500 flight hours at the cost of approximately $1.4 million per incident.

The **MQ-8B/C** had only one mishap in FY19 which occurred during maintenance. The greatest concerns with MQ-8 include unexpected climbs and descents, unanticipated turns, mission control station freeze and mishaps occurring during the start or stop sequence.

The **RQ-4A** and **MQ-4C** are in different phases of operational use and early operational testing. RQ-4A and MQ-4C HAZREPs and mishaps include situations in which lowering the landing gear was a challenge. MQ-4C Human Machine Interface continues to be an issue and requires POM support in order to make UAS more reliable for the human operator to control.

FY14-FY19 mishap and HAZREP data shows that in the UAS community the top three causal factor issues are:
- Inadequate procedural guidance or publications
- Purchasing or providing poorly designed or unsuitable equipment complacency





FY19 Trends in Squadron/Unit Aviation Safety Assessments

NAVSAFECEN performed 73 Aviation Safety Assessments by a team comprised of Navy and Marine Corps aviation subject matter experts in various aircraft. A comprehensive one-day look at each squadron consisted of seasoned Aviation Maintenance Officers, Naval Aviators, and Naval Flight Officers who primarily focused on the command's maintenance, operations, and safety departments.

The commonly observed trends listed by unit departments were:

MAINTENANCE DEPARTMENT

There were reoccurring negative trends observed during FY19 assessments. Unfortunately, these were a repeat of FY18's top negative trends. When compared with FY19 aviation maintenance mishap top causal factors, there was a direct correlation.

The top negative trends observed during FY19 aviation assessments were:

• Procedural non-compliance during routine maintenance evolutions:

A lack of proper training; lack of supervision or the wrong level of supervision present during maintenance evolutions;

Personnel performing maintenance without required publications, regardless of size and scope; and not reviewing the Non-Aeronautical Equipment Report.

• Failure to perform a proper real-time risk assessment:

Risks or hazards not identified, lack of situational awareness, lack of or improper use of PPE and lack of proper training were among the trends.

• Lack of manning, training, and equipment:

Squadrons lacked the correct fit or fill, experienced personnel to properly train, availability of parts when required, availability of required support equipment, and the sufficient availability of authorized hazard material.

These trends often resulted in observation of maintenance evolutions not supervised or supervised improperly, publication/instructions were not present during tasks, and personnel performing maintenance who were not qualified or certified for the task assigned.

SAFETY DEPARTMENT OBSERVATIONS

Manning pressures have manifested in some squadrons to the point where there are insufficient department heads for a department head to be designated as the squadron's Safety Officer without "dual hatting" other critical roles, contributing to a potential conflict of interest.

Some squadrons still lacked a formalized SMS instruction, as OPNAVINST 3750.6 requires. Squadrons vary on the implementation of a best practice, ORM "hard process" pre-flight tool. Many squadrons had outdated material in their WESS that exceeded OPNAVINST 3750.6 timelines, such as SIRs, endorsements, and mishap recommendation responses. Pre-mishap drills would benefit from increased complexity. Units needed to exercise their internal AMB and integrate external assets such as flight surgeons, crash fire rescue, air traffic controllers, etc.

Aviation Safety Awareness Programs were employed inconsistently across the NAE. Many Squadron ASO were assigned collateral duties in conflict with OPNAVINST 3750.6.

OPERATIONS DEPARTMENT

Squadrons observed in the maintenance phase of the OFRP were observed to be under a great deal of pressure. These squadrons are not billeted the maintenance or aircrew personnel that they have during the Sustainment phase; however, they are often still subject to various operational and maintenance requirements.

Some geographical areas were systemically challenged in many regards.

Personnel were not inclined to accept orders to all areas in an equitable fashion, and some areas that personnel prefer to avoid were clearly affected. Currency and proficiency gaps remained strong indicators of increased risk that affected human performance. Many squadrons were flying below DCA and CNAF flight time tactical hard deck recommendations. Pilots in some communities were flying between 8-12 hours during 30-day averages.

A safety department representative was not usually involved in the operations/maintenance long or short-range planning process in Navy units. All Marine Corps squadrons integrated the DOSS into the deliberate ORM planning process. Aircrews consistently executed weekly training, while maintenance departments used training days to catch up. Maintenance training days were usually shortened for maintenance and did not include "in rate" training. Squadrons were concerned with lack of CQ or DLQ opportunities to maintain proficiency.

COMMUNICATIONS

The best observed squadrons shared a common theme of effective communications vertically and laterally. Effective squadron commanding officers communicated with department heads and officers as well as provided schedule updates and expectations directly to command personnel via a combination of written and verbal communication.

FY19 Aviation Directorate Studies

During FY19, NAVSAFECEN's Aviation Safety Directorate and Aviation Division of Knowledge Management conducted the following studies:

- Rising trend of discoveries of serious depot level maintenance errors and malpractice
- Class B mishap root-cause analysis FY15-FY18
- Naval airport infrastructure study
- Aircraft maintenance maintainer head protection study
- Shortfalls in IMRL and GSE study
- Second study of aircraft cannibalization rates involving FY14-FY18 for F/A-18, H-60, H-53, and V-22 Class A-D mishaps and maintenance data to determine the cannibalization rate, in which the risk of a mishap is more likely to occur
- Deteriorating material condition of Ready Service Lockers/Magazines
- Reoccurring mishaps and hazards due to cross wiring of UH-1Y flight control cables
- SAR response in ITRA-South, Iwakuni
- H-53 Structural Issues
- H-60 Aviation Ground Mishaps
- Thermion flight deck coating

Lessons Learned (LL) and Sanitized Safety Investigation Reports (SSIR)

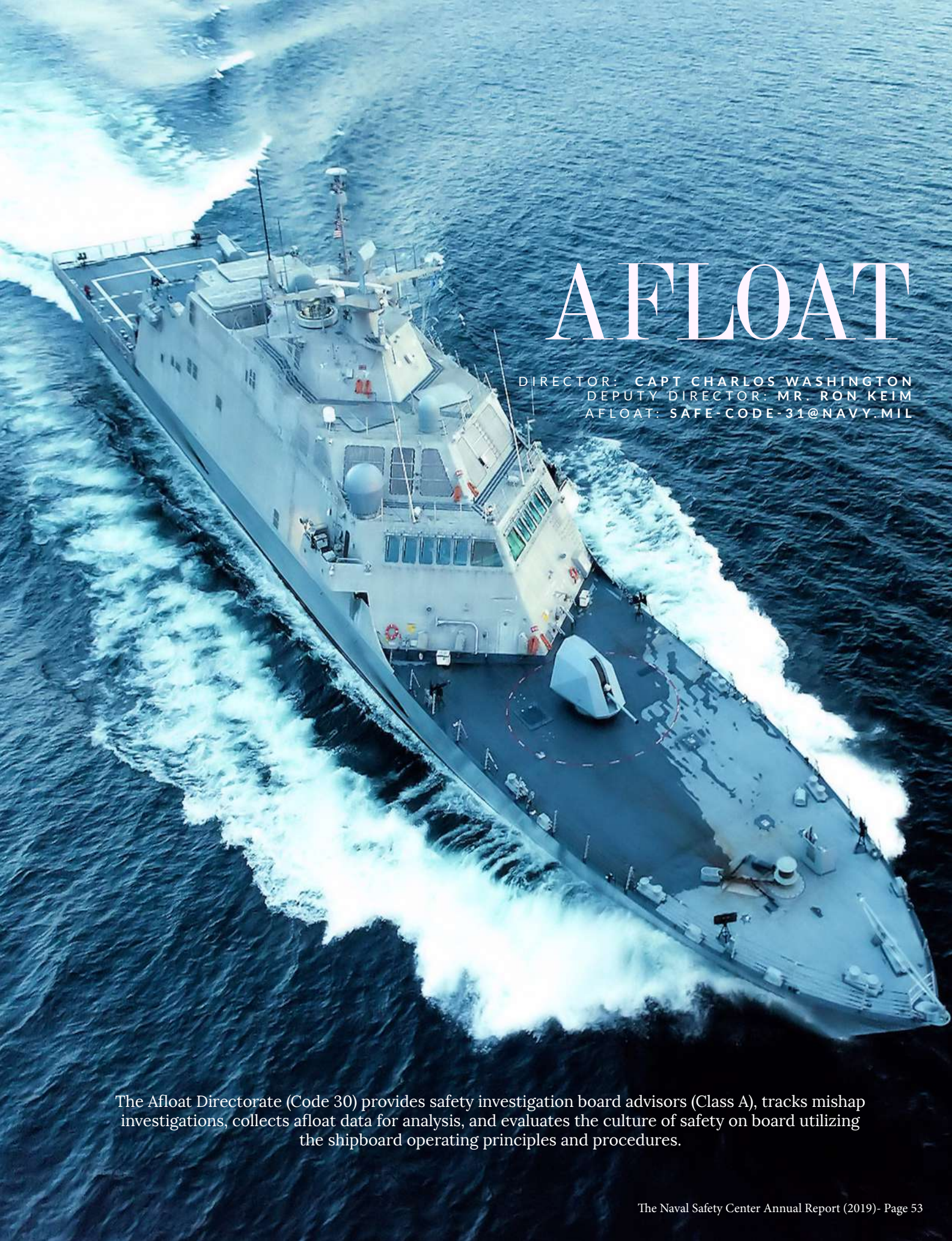
During FY19 the Naval Safety Center developed and disseminated the following Lessons Learned and Sanitized Safety Investigation Reports for the Aviation community:

1. LL 18-16 Helo Sonar Losses
2. LL 18-17 Shipboard Aircraft Refueling Contamination
3. LL 19-02 Aircraft Move Briefs
4. LL 19-03 UH-1Y Crossed Flight Control Wiring
5. LL 19-04 Firefighting w/composites
6. LL 19-15 Screening Aircraft Components
7. LL 19-20 Aviation Support Equipment Shortfalls
8. SSIR 18-11 CV Hangar Bay Aircraft Fire
9. SSIR 19-01 Flight Deck Wave Incursion
10. SSIR 19-02 Helo Mountain Crash
11. SSIR 19-03 Flight Deck Aircraft Collision
12. SSIR 19-04 TH-57 Wire Strike
13. SSIR 19-09 Aircraft Ailerons Damaged During Maintenance
14. SSIR 19-10 Helo Water Impact
15. SSIR 19-12 Small UAS Mishap
16. SSIR 19-13 Rotary Wing UAV Mishap
17. SSIR 19-14 Aircraft Ditched at Sea
18. SSIR 19-15 Aircraft Gust Lock HAZREP
19. SSIR 19-17 Machine Gun Clearing Mishap

All of these Lessons Learned and Sanitized SIRs are available on the "Lessons Learned" pages of the Naval Safety Center's CAC-enabled website, https://intelshare.intelink.gov/sites/navsafe.

GLOSSARY

A/C	Aircraft
AGMs	Aviation Ground Mishaps
AFFF	Aqueous Film Forming Foam
ALFS	Airborne Low Frequency Sonar
AMB	Aviation Mishap Boards
ASAPs	Aviation Safety Awareness Programs
ASO	Aviation Safety Officers
BASH	Bird/Wildlife Aircraft Strike Hazard
BFWS	Blade Fold Wing Stow
CAD	Cartridge Activated Device
CAS	Close Air Support
CFIT	Controlled Flight Into Terrain
CNAF	Commander, Naval Air Force
CNATRA	Chief of Naval Air Training
CNO	Chief of Naval Operations
CRM	Crew Resource Management
CQ	Carrier Qualification
DCA	Deputy Commandant of Aviation
DOSS	Director of Safety and Standardization
DLQ	Deck Landing Qualification
DVE	Degraded Visual Environment
ECS	Environmental Control Systems
ENV/WX	Environment/Weather
FCF	Functional Check Flight
FOD	Foreign Object Debris/Damage
FLIR	Forward Looking Infrared
FMs	Flight Mishaps
FY	Fiscal Year
GSE	Ground Support Equipment
HAZRECs	Hazard Recommendations
HAZREP	Hazard Report
HRST	Helicopter Rope Suspension Technique
IPP	Integrated Power Package
IMRL	Individual Material Readiness List
ITRA	Iwakuni Temporary Reserved Airspace
LPD	Amphibious Transport Dock Ship
MFCD	Multi-Function Color Display)
MPRA	Maritime Patrol and Reconnaissance Aircraft
MISRECs	Mishap Recommendations
NAE	Naval Aviation Enterprise
NAMP	Naval Aviation Maintenance Publication
NAS	Naval Air Station
NAVAIR	Naval Air Systems Command
NAVSAFECEN	Naval Safety Center
NMAC	Near Mid-Air Collisions
NSC	National Safety Council
OFRP	Optimized Fleet Response Plan
OPNAVINST	Office of the Chief of Naval Operations Instruction
ORM	Organizational Risk Management
PEs	Physiologic Events
PERRTs	Physiologic Event Rapid Response Teams
PPE	Personal Protective Equipment
POM	Program of Memorandum
RCCA	Root Cause and Corrective Action
SAR	Search and Rescue
SIR	Safety Investigation Report
SMFCD	Smart Multi-Function Color Display
SMS	Safety Management System
SSWG	Systems Safety Working Group
TFOAs	Things Falling Off Aircraft
T/M/S	Type/Model/Series
TYCOM	Type Commander
ULE	Unauthorized Laser Events
USMC	U.S. Marine Corps
USN	U.S. Navy
WESS	Web-Enabled Safety System



AFLOAT

DIRECTOR: **CAPT CHARLOS WASHINGTON**
DEPUTY DIRECTOR: **MR. RON KEIM**
AFLOAT: **SAFE-CODE-31@NAVY.MIL**

The Afloat Directorate (Code 30) provides safety investigation board advisors (Class A), tracks mishap investigations, collects afloat data for analysis, and evaluates the culture of safety on board utilizing the shipboard operating principles and procedures.

Dynamic Assessments (Underway Group Sails) Code 31

As a result of the Comprehensive Review and SECNAV Strategic Readiness Review, the Naval Safety Center's Surface Assessments Division (Code 31) is shifting from static (in port) to dynamic (underway) assessments. The intent is to complete dynamic assessments as a scheduled and predictable part of the deploying group's (CSG or ARG) OFRP. The primary purpose of shifting from static to dynamic assessments is to observe more operational safety items (e.g., special evolutions, Condition III watch standing, or any event that requires ORM; TCRM; and the PBED process).

Two successful beta test assessments were conducted in 2019. The assessment teams of three to six personnel will be onboard for two to three days before transferring to the next unit as scheduled in the scheme of maneuver. The team will not ask to observe any particular event; they will observe activities in accordance with the schedule of events of the group sail. The team will observe the brief and execution of the event from multiple locations, debrief, and how the lessons learned are captured and used in the next planning iteration.

For assessment of Condition III watch standing, the assessment teams will observe the bridge, CIC, and engineering to ensure procedural compliance of standing orders and applicable procedures. In addition, the teams will specifically look for indications of common causal factors of historical surface ship mishaps.

The goals of the new assessment model are to capture data on how well ships are executing operational safety, use the collected data in a manner to better assist in preventing mishaps, and to provide immediate feedback to the commanding officer relating to the ship's safety culture.

FY19 Mishap Trends and Reporting

Overall, afloat mishap reporting remained constant from FY 2018 to FY 2019.

There were 1,767 afloat mishaps and HAZREPS reported in 2019: 4 Class A (up 100 percent from FY 18), 10 Class B (down 50 percent from FY18), 267 Class C (down 25 percent from FY18), and 934 Class D (down one percent from FY18). There were 552 hazard reports submitted (up 18 percent from FY18). Reporting is key to future mitigation.

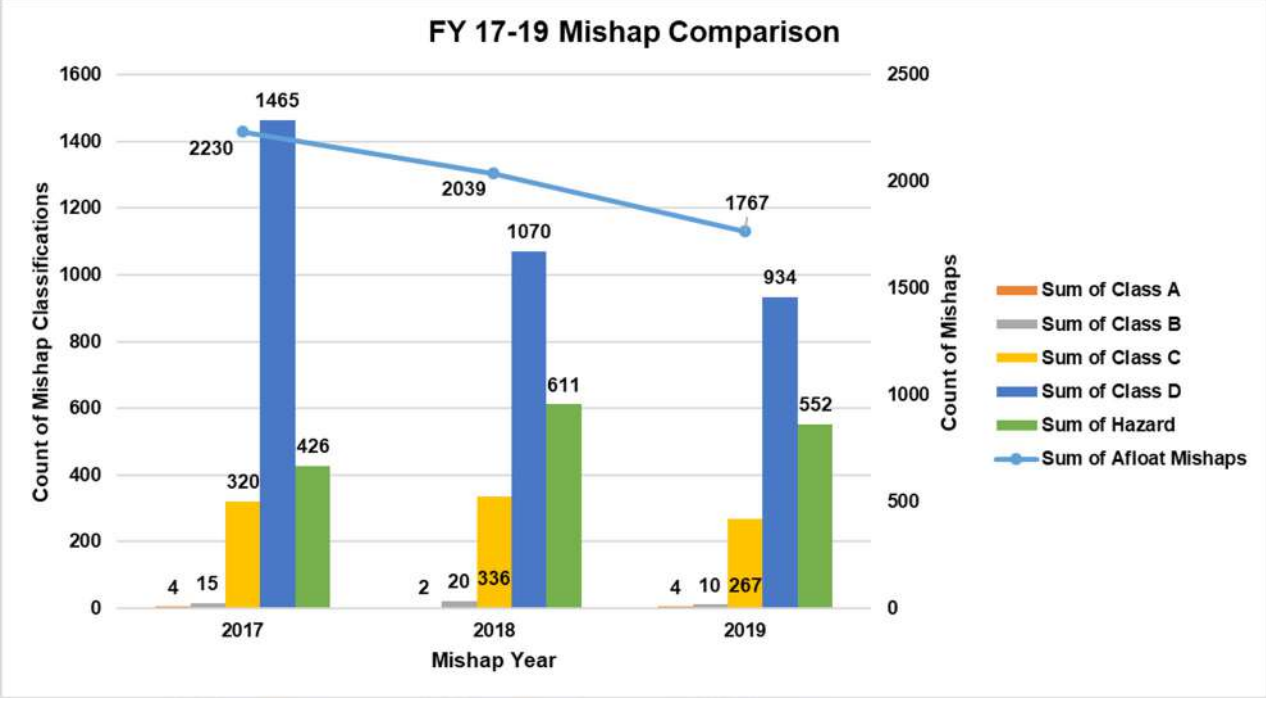
Overall injuries from mishap reporting declined from 2017-2019. However, injuries on average showed real decrease, down 21 percent (ratio wise). In FY19, there were 1,006 afloat injuries (down 47 percent from FY18) accounting for 168 days of hospitalization (down 10 percent from FY18), 4,275 lost work days (down 34 percent from FY18), and 10,148 days of light or limited duty (down 21 percent from FY18).

Continue to stay aware of your surroundings as we move through 2020. Report early, report often. Reporting is key in bringing awareness to make an effective change for the future of our Sailors and Marines in their work centers.

Mishaps across the fleet – Class Type

As we strive to maintain the safest fighting fleet, mishap reported by class type gives us an understanding of when reporting is occurring. Timely reporting of mishaps enables NAVSAFECEN to effectively track and guide focus toward a safer naval fleet.

Below are type class comparisons from FY 17 and FY 19.



CVN – Aircraft Carrier

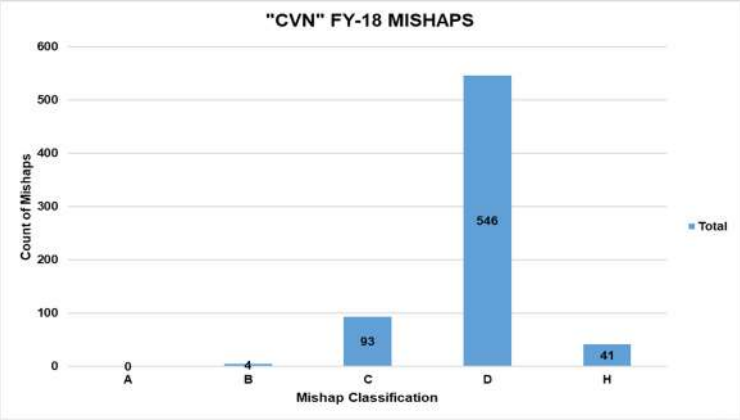
FY 19 Class A: Service member returning from liberty fell from ACE while crossing the brow and sustained fatal injuries.

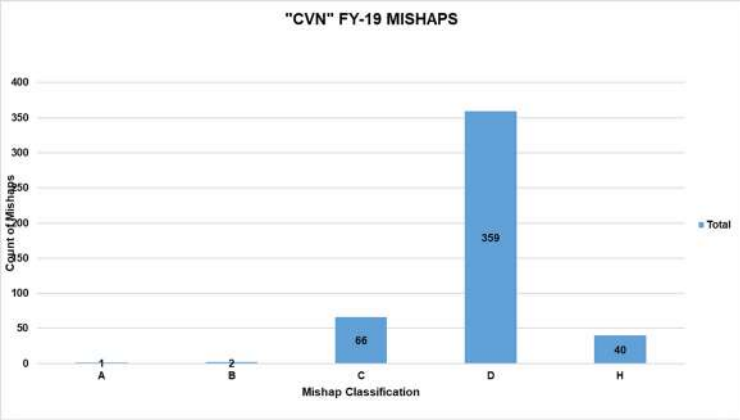
Contributing Human/Casual Factors:
• CVN did not take into account fall protection hazard on either side of the enlisted brow located on ACE 1.
• CVN utilized inadequate steps at the base of the enlisted brow.
• Service member did not come across the brow in an appropriate condition.

SSOPP Deviations:
Procedural Compliance, Integrity, and Forceful Backup.

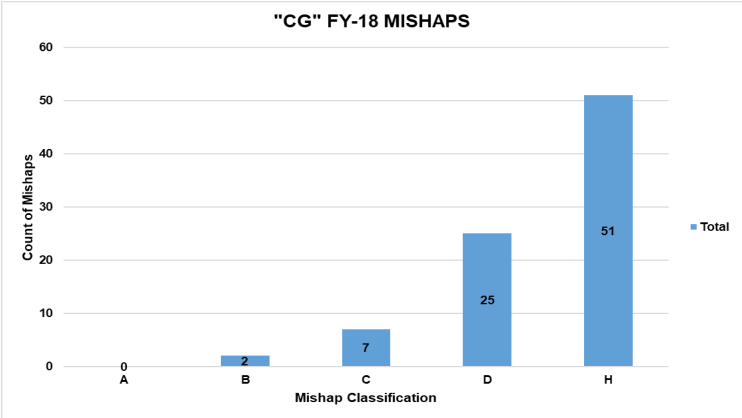
Preliminary Lessons Learned/ Recommendations:
• Any fall protection hazards identified in the fall protection survey, as required by OPNAVINST 5100.19F, shall be adequately addressed.
• Build standard steps for when stepping off the brow onto the ship.
• ECP training and checks (alcohol and footwear) and duty section training for checks.
• When anticipating significant numbers of returning intoxicated Sailors and Marines, position duty section watch standers at foot of the brow or ECP to monitor Sailors and Marines for safety prior to climbing the brow, and to provide assistance or further evaluation as needed.
• Update Fall Protection Program to include items relevant to this mishap and not just aloft or over the side.
• Provide adequate steps to CVNs after positioning brows.
• Provide a physical barrier (similar to Garlock Safety Barriers) to serve as a physical safety barrier around the perimeter of the ACE when used as the enlisted brow.

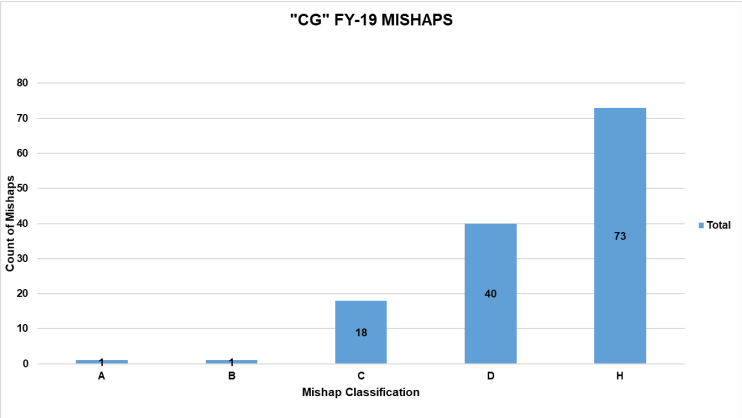
CVN – Aircraft Carrier





CG- Cruiser (Guided Missile)





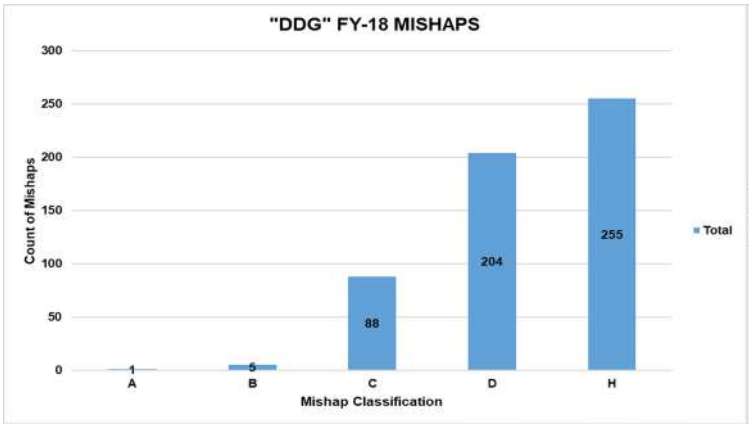
FY 19 Class A: Stern to stern collision while conducting a CORPEN N (vessels turning simultaneously) during CONREP.

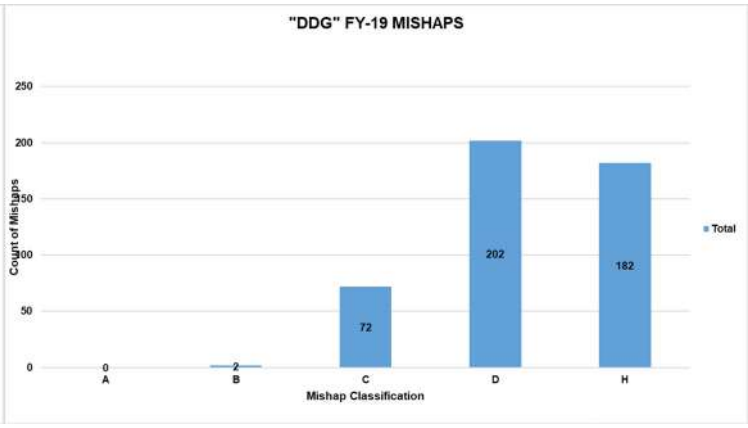
Contributing Human/Causal Factors:
• Bridge team overcontrolled ship while in close proximity to another vessel during CORPEN N.
• Combat Information Center and Navigation team lost situational awareness of synthetic geography.

SSOPP Deviations:
• Procedural Compliance and Forceful Backup

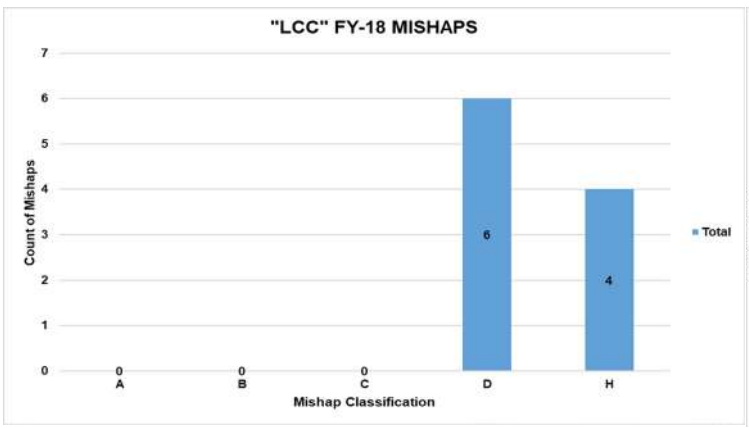
Preliminary Lessons Learned and Recommendations:
• Conduct a class-wide assessment of instrumentation and decision aids on CG bridge wings.
• Conduct a study on optimizing pallet location and breakdowns on CGs during CONREPs.
• Incorporate CORPEN N training into NSST special evolutions training.
• Develop training methods to induce high-stress stimulus so that bridge watchstanders understand the physiological reactions that may occur and develop resilience to them.
• Ensure a conning coach is on station during special evolutions.
• Develop standardized briefing requirements for special evolutions to include required topics, attendees, and muster documentation.
• Ensure CIC and Navigation watchstanders maintain accurate overlays of battlespace on tactical display systems.
• Ensure CIC watch teams are vigilantly monitoring message traffic and comparing execution messages against planning briefs and documents.

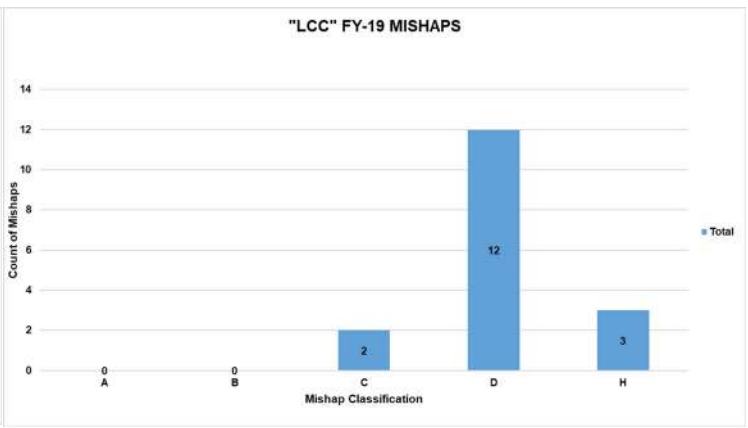
DDG- Destroyer (Guided Missile)



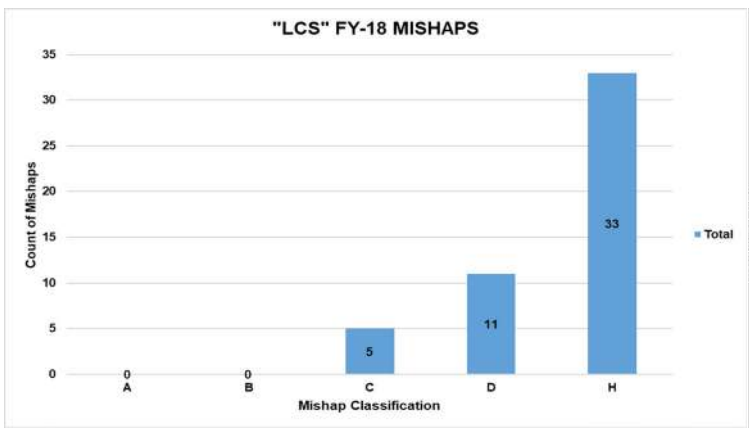


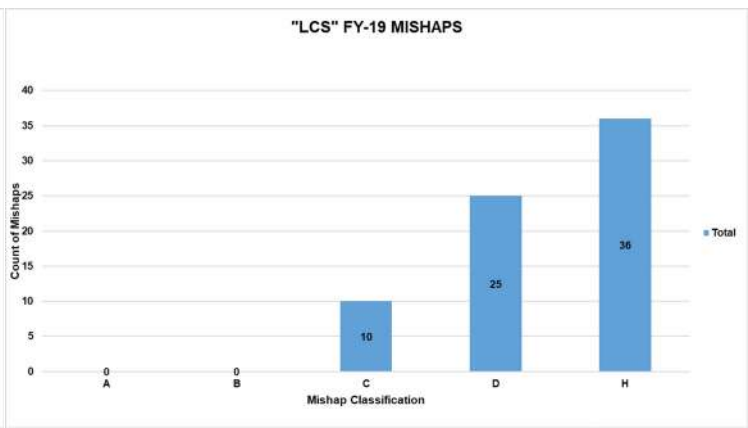
LCC – Amphibious Communications Command



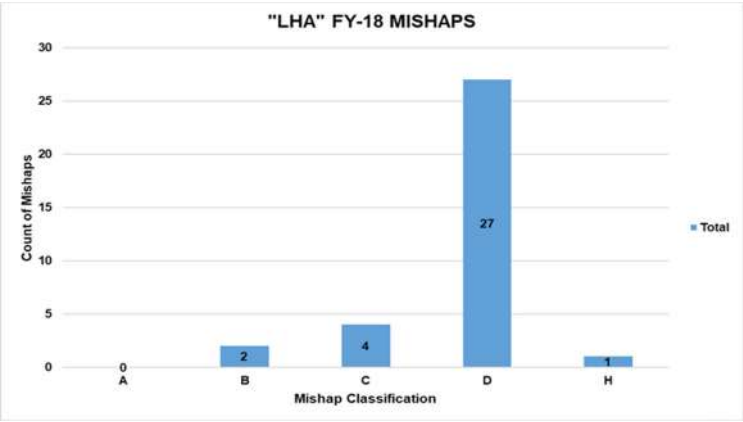


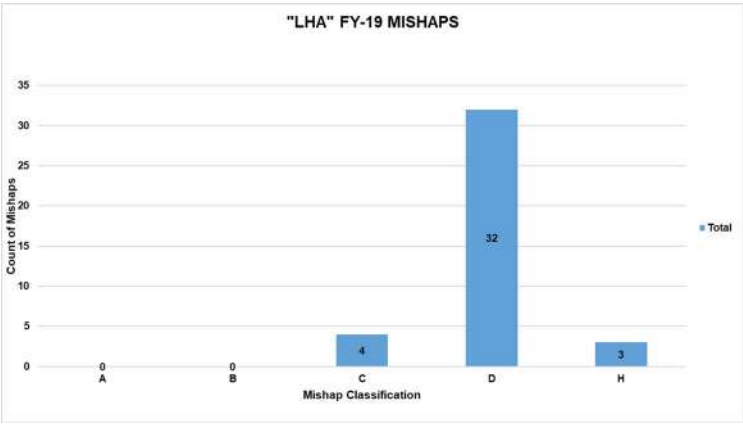
LCS -- Littoral Combat Ship



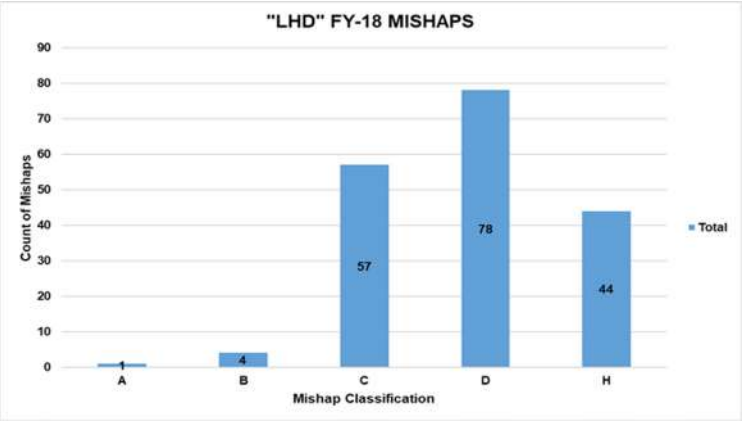


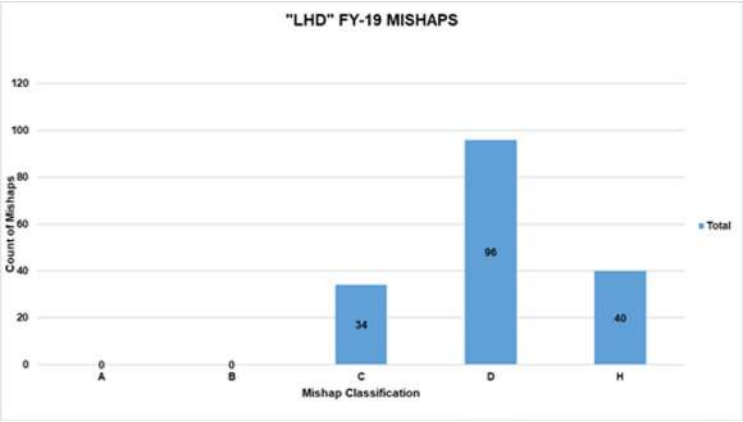
LHA -- Landing Helicopter Assault



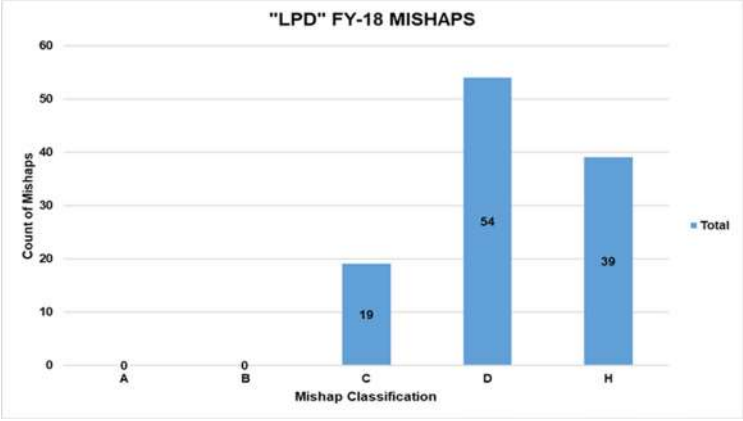


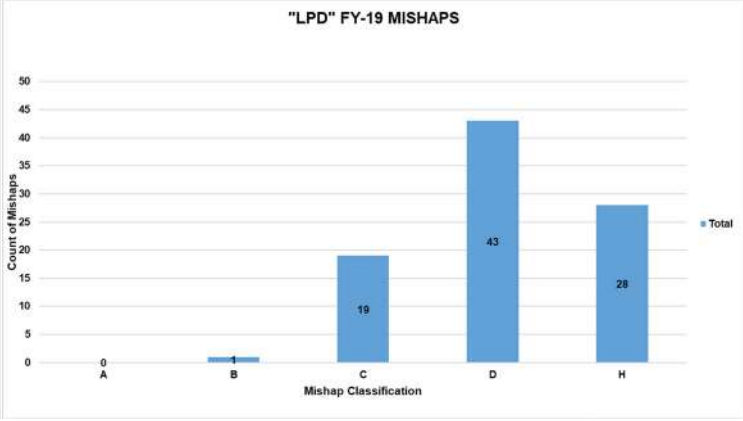
LHD – Landing Helicopter Dock



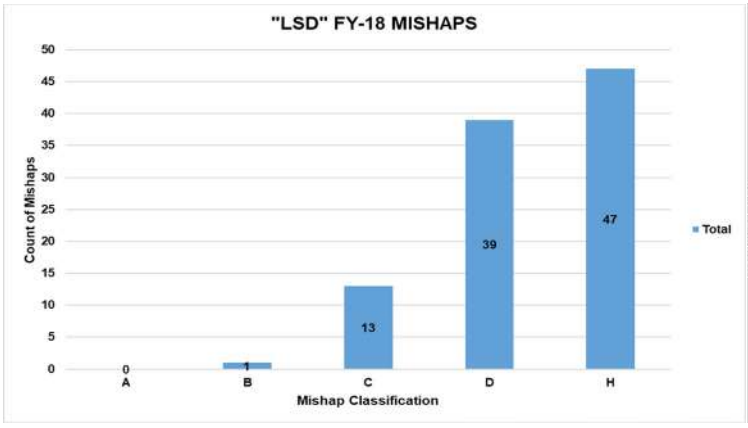


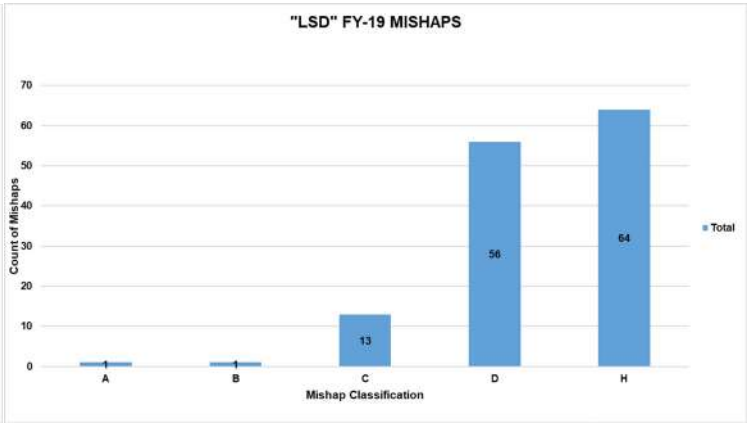
LPD – Landing Platform Dock



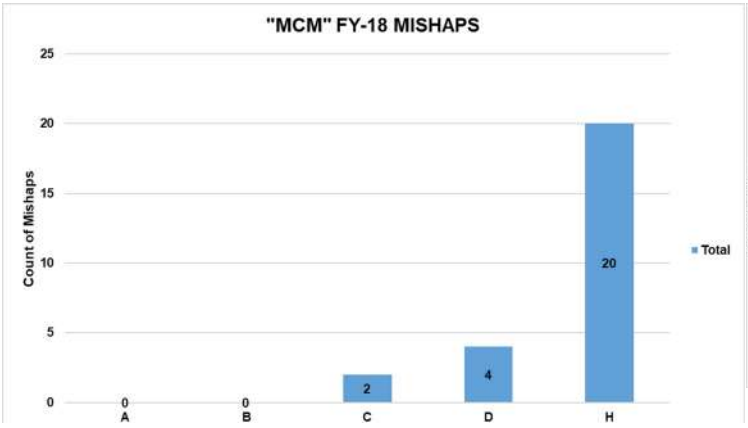


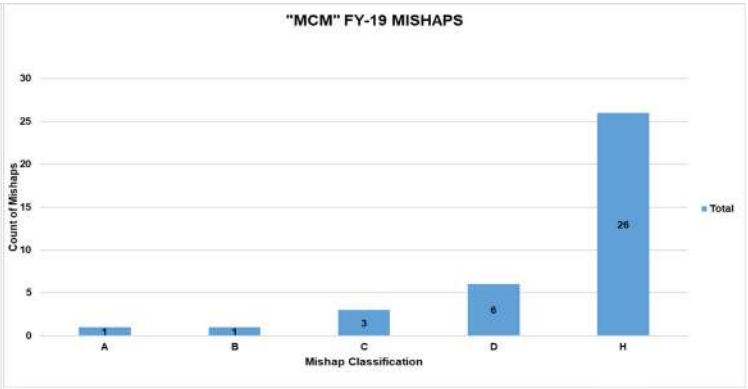
LSD – Landing Ship Dock



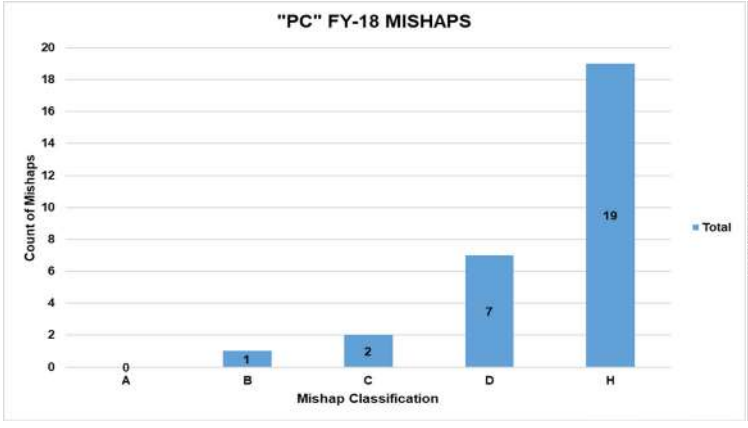


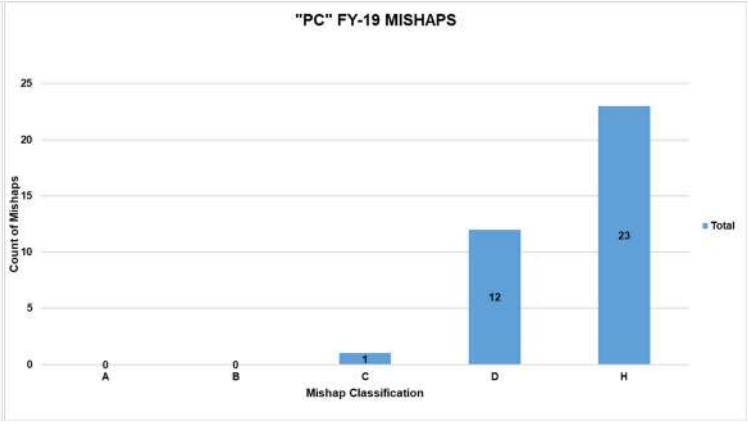
MCM – Mine Countermeasures





PC –Patrol Craft





FY19 Class A:

During underway operations, ship experienced heavy seas which resulted in 2 LCUs coming loose in the well-deck.

Contributing Human and Causal Factors:
• Ship's force/LCU crew secured the two LCUs in a "married" configuration during the Atlantic transit.
• Ship's force did not properly shore the LCUs in accordance with IAW NSTM 584 or COMNAVSURFPACINST/COMNAVSURFLANTINST 3340.3E (Wet Well Manual).
• Neither LCUs were griped and secured per NSTM 584 and Wet Well Manual.
• The ship was in a non-standard load and ballast configuration.
• LCUs did not have BOATALT 352B installed.
• The load plan, a component of the PERMA process, was not formally developed by the planning team for commanding officer approval.
• Ship's force used at least two cloverleaf deck fittings that had been previously identified as defective and placed out of service in order to secure the forward LCU.

SSOPP Deviations:
• Procedural compliance
• Integrity
• Level of Knowledge
• Forceful backup
• Questioning attitude

Preliminary Lessons Learned/ Recommendations:
Amphibious Ready Group Commanders impose an interim OTSR limit of 12/10/12 for LSDs carrying LCUs pending review and validation of Wet Well Manual and NSTM 584.

This review and validation of NSTM 584 and the Wet Well Manual, Commanding Officers and Beach Group Officers in Charge should co-sign a temporary standing order for each LCU that addresses the number of lashes and shores to be used as well as their positioning and attachment points both on the craft and conduct a technical assessment for securing two LCUs in the well deck of an LSD 41 class ship. This shall address the location of deck fittings and sensitivity of craft positioning as ship deballasts. This assessment should validate the ship's ability to properly secure two unmarried LCUs and in accordance with existing procedural guidance of NSTM 584 (i.e. 22+ gripes, 45 degree angle, bow chains, etc). This assessment should also take into consideration both BOATALT 352B and legacy LCUs that do not have BOATALT 3. Reconcile requirements of NSTM 584, MCTP 3-10C (formerly MCWP 3-13, Employment of AAVs), and Wet Well Manual for securing AAVs for both benign weather and heavy weather conditions, to include defining heavy weather. Specifically, clarify when AAVs require more than four 70,000K gripes based on weight of AAVs, enhanced armor kit, and expected weather. The documents are currently not aligned.

Update the Wet Well Manual to address the contributing factors for securing LCUs.

Direct all amphibious ships to include limiting draft and limiting displacement per the damage control book (Stability) on the daily draft report and require commanding officer signature if draft or displacement exceeds allowable limits. Review the operational guidance that L-Class ships (particularly LSDs) follow for managing ballast (i.e. limiting draft and limiting displacement) during open ocean transits and what action is appropriate if a ship cannot meet the limiting draft, or limiting displacement requirements of the ship's Damage Control book or FCCS software. Include a mechanism for reporting non-compliance up the chain and requesting a departure from specification so that risk is understood and shared at appropriate levels. In simple terms, exceeding limiting draft when not conducting amphibious operations should be treated as a casualty condition.

Add assessment criteria in AMW mission area during basic phase for ships to demonstrate construction of shoring. This need not require recovering an LCU and deballasting to a dry well. Ships could simulate the LCU by parking yellow gear at the appropriate spot in the well deck to mimic the geometry of where the LCU will be shored. The training objective is to construct a proper shore in the well deck at the appropriate spacing from the wing wall.

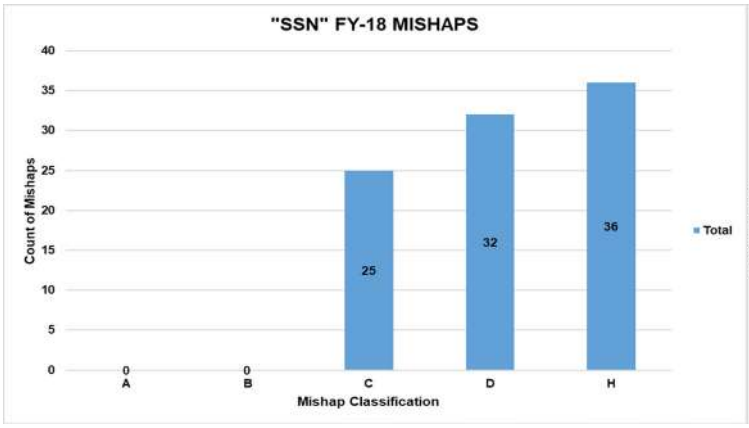
Review CSMP to ensure all cloverleaf padeyes that have been identified as out of commission have a clear path to replacement during phased maintenance availability.

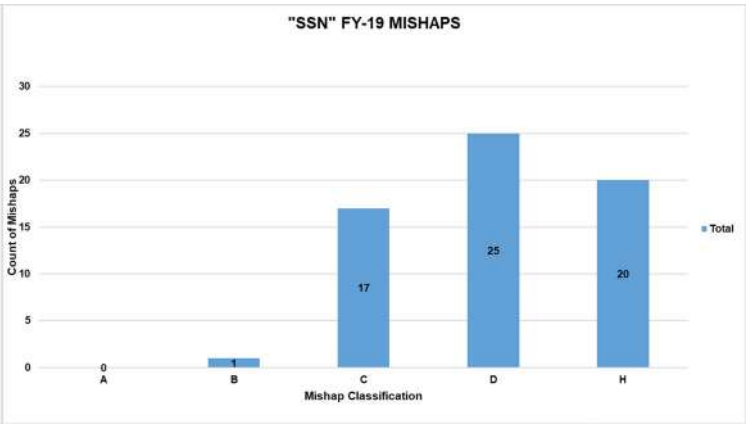
Lessons Learned

Amphibious Ready Group Commanders impose an interim OTSR limit of 12/10/12 for LSDs carrying LCUs pending review/validation of Wet Well

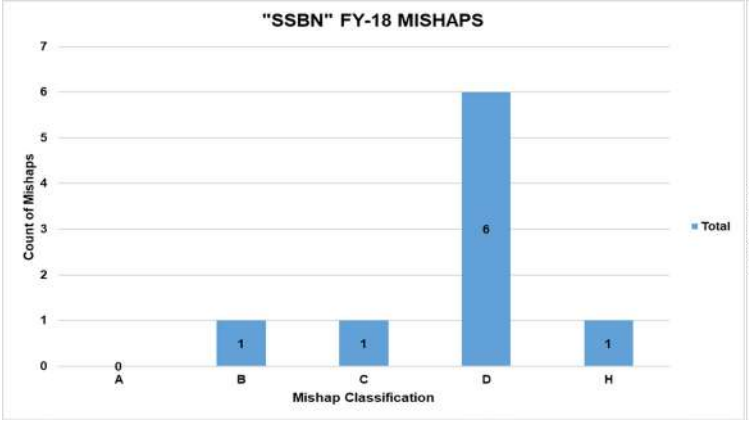
Update the Wet Well Manual to address the contributing factors for securing LCUs.

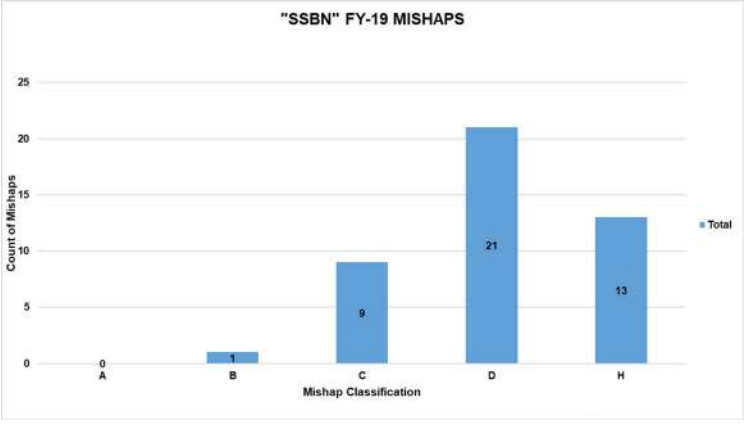
SSN – Submarine (Fast Attack)



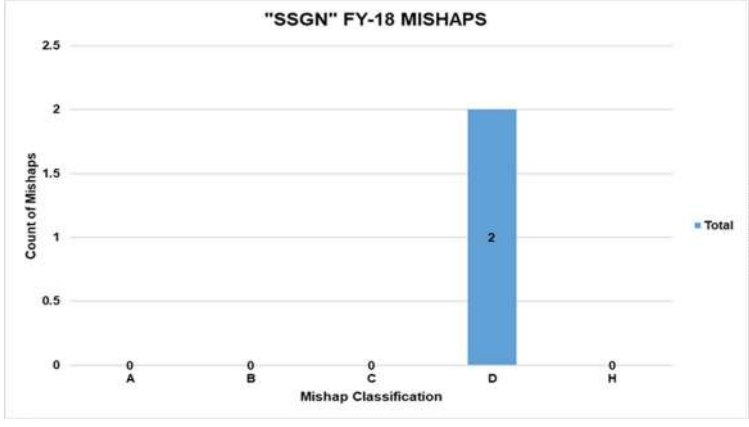


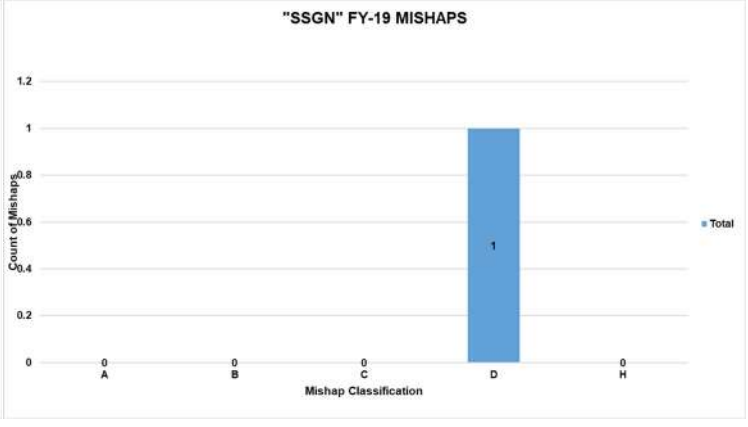
SSBN – Submarine (Ballistic Missile)



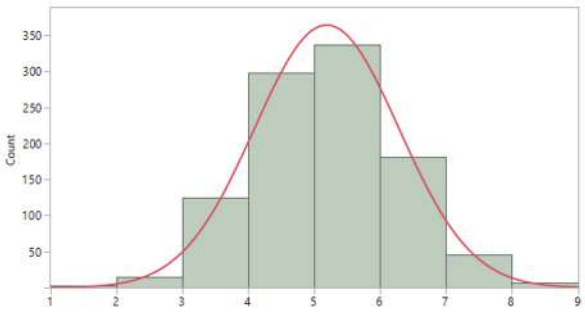


SSGN – Submarine (Guided Missile)





FY19 Afloat Directorate Studies (Completed)



1. Mishap Investigation 101 – When a reportable mishap occurs in the fleet, a WESS report submission is required. A complete WESS report will take time and effort, and it can be cumbersome to complete all of the relevant safety information to ensure proper documentation. The best way to achieve WESS safety reporting success is by asking: Who, What, When, Where, Why, and How. The data gathered helps develop future risk mitigations, further procedural guidance development, and development of predictive models based on comprehensive analysis. The quality of safety analysis available to our fleet depends on our Sailors and Marines being honest and transparent when mishaps occur. The Naval Safety Center is constantly on watch, compiling our safety data to help maintain readiness, minimize unnecessary risk, and maintain naval forces' lethality.

2. Under Reporting of Fires – 0230, all is quiet, "Fire, Fire, Fire. Fire in compartment 3-45-3-L. Away the In-port Emergency Team!" After the scramble to put out the fire is complete, did the ship report the fire via WESS? A study found that 92 percent of in-port fires go unreported. Data from 2017 to 2018 was compiled with assistance from NAVSEA Trouble Report Data and included NFIRS and self-reporting data generated during a NAVSEA PFOR data call to granulate the accuracy and extent of this failed safety throughput. Reportable fires are any unintentional fires occurring on an Naval installation, ship, sub, or aircraft (to include small fires in which no personnel were injured and the material property damage was limited to the originally ignited materiel and not propagated to other materials). Fires are unintended states, processes, or instances of combustion in which fuel or other material is ignited and combined with oxygen, giving off smoke, sparks, or flame. Smoke or sparks may or may not be present. However, if unexpected smoke or sparks exist, a fire should be assumed to exist. This is especially relevant to Class "C" fires when the smoke or sparks cease after power is secured. Evidence of previously unreported combustion or explosion should also be reported upon discovery. Reports solely based on acrid odor with no evidence of combustion upon inspection are not required to be reported. Without reporting, the fleet's Fire Risk is obscured, and thereby no effective mitigation strategy can be designed or implemented.

3. Half Life of Scared - In 2018, VADM Richard Brown, COMNAVSURFPAC Commander, released a message titled, "The Half-Life of Safety." VADM Brown stated, "Surface Force Commanding Officers are very good at making risk decisions if they recognize the risk and see that a mishap is possible, but this awareness requires a keen awareness of the most likely and most dangerous threats." "There is always a tendency to become less concerned about threats over time. To try and validate this, the NAVSAFECEN took a deep look into the past 15 years of seamanship related mishaps (collision, allisions, and groundings). Using simulation modeling, the NAVSAFECEN was able to estimate the mean time between seamanship related mishaps is 193 days. What does that mean? It means that "the awareness of the magnitude of the threat," statistically fades as ships' crews complete the immediate corrective actions of Mishap Boards, or move in-between the phases of the OFRP cycles, or transfer to new commands. Valuable lessons are documented and filed away, corrective plans of action and milestones are marked complete, and our immediate attention moves to the next challenge. It is a statistical likelihood that the potential for a new mishap increases unless this cycle is purposely interrupted." The statistical model was built using Class A mishaps as a benchmark for the fleet, assuming that the fleet was aware of another ship's Class A mishap, and the basic factors surrounding the event.

Based on the fact that these events are relatively infrequent, the historical data only contained 25 events. Through statistical modeling that generated over 2,000 data points, a refined statistical mean of 193 days yielded a 95 percent confidence level ranging from 133 to 293 days. Based on this analysis, a plausible preventative remedy of establishing a quarterly seamanship training refresh interval is necessary. Remedies include a review of seamanship mishaps and underlying causal factors, which should help our crews maintain the right levels of seamanship situational awareness, and help commands prevent Class A mishaps.

4. Hazard Abatement – What is the secret to self-assess correctly and efficiently? It is the proper implementation of the Hazard Abatement Program. NAVSAFECEN has developed a spreadsheet to assist safety officers in their safety program management and hazard trend identification provided to each Safety Officer Course graduate. OPNAVINST 5100.19F places safety discrepancies into two categories: discrepancies that can be corrected "on the spot" and those that cannot. The safety officer shall maintain documentation of identified safety hazards and the Hazard Abatement Log (log, notebook, electronic spreadsheet, or other means) can be used to document deficiencies awaiting correction.

It shall consist of, at a minimum:

(1) Date, time, location, and description of hazard;

(2) RAC;

(3) Recommended corrective action to control or mitigate;

(4) Action(s) taken to implement correction; and

(5) Verification of completed abatement and date corrected.

While NAVSAFECEN sees attempts to utilize OMMS NG as a tracking and trending tool for hazard abatement, OMMS NG does not meet the intent of the Hazard Abatement Log. Once a job completed in OMMS NG, it is archived and cannot be assessed for trending purposes for the Safety Officer.

5. Stress-Induced Injuries – As world events unfold against America's interests, the Fleet is called upon as America's 911 force. We always answer her call - Sailors and Marines proudly jump into action as "Underway- Shift Colors" is announced to defend our American way of life, but that exacts an emotional toll from time to time. Over four years, 2014 to mid-2018, 3,000 man-hours were lost due to Sailors and Marines releasing stress through aggression, such as hitting lockers, bulkheads, and hatches. The data revealed 154 unique WESS reports related to anger, frustration, and emotional outbursts, with 50% of the at-risk population between ages 18-22. The fleet's operational stress control program (https:/www.public.navy.mil/bupers-npc/support/21st_Century_Sailor/osc/Pages/default.aspx) contains the latest information on effective stress management techniques and tools. Help your young Sailors and Marines learn to manage their emotions in healthy ways before you need them to have this capability under fire.

6. Small Boat Operations – Small boat operations mishaps have been trending upwards recently in the Fleet. This study investigated leadership at the deckplate level, emphasizing the importance of the PBED process. The data suggests the review and integration of COMNAVSURFLANT 131824Z NOV 18 into both your command small boat operations and your boat crew continuous training pipeline to ensure safe evolutions and practices.

7. Fasteners, Screws, Bolts – "Flooding, Flooding, Flooding; Flooding in Compartment five tack…" These are the most cringing words to hear on the 1MC while operating in the middle of the ocean. Many of us see missing fasteners, screws, and bolts on equipment as we traverse the fleet. We scramble to fix these discrepancies as the next zone Inspection approaches. "If it fits, put it in" is the usual mantra. However, the investigation into the dangers of interchangeability of fasteners resulted in 12.5 percent of flooding mishaps in the last five years. Fasteners are not as interchangeable as we want to believe. Dissimilar metal and opposing metals lead to quicker corrosion. Inches versus metric, and thread composition, are also key elements in preventing flooding and undue wear and tear. Ensuring proper markings and class Identification of fasteners with the right equipment is paramount. Using the SMART process will greatly reduce self-inflicted flooding and corrosion.
S = Survey physical environment fasteners to be installed;
M = Markings verification? Do you have the right fastener installed?;
A = Assess installation work package currency and Account for all materials – consider "bag and tag" as a good general maintenance practice, regardless of the class fastener;
R = Record fastener installation specifics (# of times) and Report discrepancies;
T = Torque (20-90 Rule) it right!

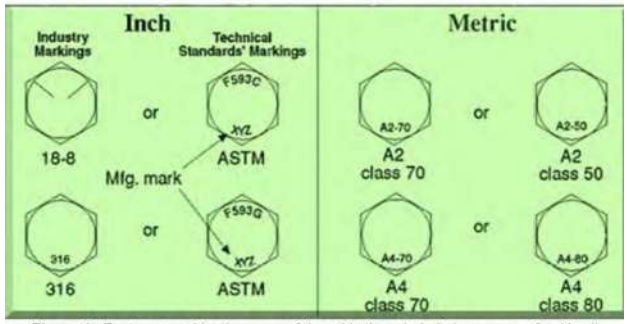


Figure 4. Fastener marking is purposeful, and is there to help keep you safe. Use it.

8. Electrical Safety

Corrosion is a war continuously fought onboard ships as we operate in harsh maritime environments. Unfortunately, due to corrosion, we sometimes overlook places where corrosion buildup can lead to a blue on blue casualty - from our electrical panels! Corrosion prevention is critical to prevent high resistance and local heating that can cause fuse links to melt prematurely. NSTM 300 section 300-2.5.3.1-c provides a solution to this; silver plated ferrules! Why the concern? NSTM 300-4.8.1.4 states, "When electrical connection design requires dissimilar metals to come into contact, galvanic compatibility is managed by silver plating. If the connector surface or bus bars cannot be silver plated in a shop environment, an acceptable method is to use Cool-Amp (NSN 6850-00-561-0349)." Cool-Amp is a water-soluble, white powder used to apply a protective coating of silver metal on copper or low-alloy brass and bronze substrates. Remember that silver-to-copper is unacceptable for power connections, which is why silver-to-silver is a requirement in a harsh marine environment. Silver-to-copper will result in galvanic corrosion. Silver-plated ferrules will be denoted with a stamped "S" at the end of the current rating (e.g., F60C 500V 5AS) and should match with silver-plated fuse clips. Once silver-plated ferrules and clips are in place, replace worn components with silver-plates – never brass or nickel fuse ferrules or fuse clips.

Shipboard supply storerooms should be purged of all brass or nickel ferrule fuses to prevent inadvertent installation into shipboard systems.

9. Electrical Hazards

During AOSAs, onboard both LCS class variant platforms, NAVSAFECEN observed 440-volt heaters in the overhead contained only one detent style fastener to keep it closed. Underway, this fastener can become loose and allow the cover to swing open, exposing Sailors and Marines and in-port civilian contractors to a severe contact hazard. NAVSEA is currently validating this hazard observation, conducting vibration testing to these 440-volt heater panels when these LCSs are underway, to develop a permanent mechanical fix.

10. Electrical Work Benches

In 2012, NAVSEA released revision nine (Rev. 9) to the NSTM 300, Electric Plant General. One noticeable change regards electrically safe workbenches. Commands are now required to maintain at least one electrically safe workbench and work with the SMMO to submit a temporary DFS and associated OPNAV Form 4790/2Ks (2-Kilos) for repair.

For all ships assessed since 2012, during their AOSA by the NAVSAFECEN, 98.6 percent complied. However, only 22 percent of the ships have more than one electrically safe workbench, and only 11 percent have fully functioning workbenches as designed, which comprised of mostly newly constructed commands. Commands are reminded to identify the requirements for a certified electrically safe workbench. Use these guidelines: (1) apply a trained eye to identify discrepancies utilizing references; (2) select the correct materials and parts required using the current parts list; (3) apply technical drawings and the NSTM 300, Appendix H, to return equipment to readiness condition; and (4) perform maintenance requirement MIP 6652/006 MRC A-1.

11. Gun Handling/Misfirings/Negligent Discharges

Mishaps while handling firearms remains an ever-present source of preventable risk. This risk ranges from Sailors and Marines exercising poor cleaning habits with personal weapons to arming down from a watch to routine PMS checks. This paper investigated 30 months' of reported small arms mishap data to discover there had been 70 mishaps of Sailors and Marines off duty inadvertently shooting themselves, and 35 off-duty negligent discharges that resulted in 604 lost workdays and one fatality. Recently, the fleet suffered an upswing of on-duty negligent discharges while performing M9 PMS, involving blank rounds. After careful study, the new FR 1-20 changed the current PMS requirement from using blank rounds to not requiring the use of blank rounds while performing the routine maintenance checks.

12. Afloat Deep Sink Burns

Our young Sailors and Marines are the lifeline of our fleet. Many impressionable young men and women serve in our galleys as TAD members of our ships' galley and scullery crews. Since October 2013, 47 reported mishaps have occurred during operations of deep sinks. Many of these instances were caused when assigned personnel either did not understand or did not follow the posted safety guidelines for the operation of the deep sink, or improperly donned their assigned PPE. The study found that of the 47 burn injuries, 41 or 87 percent were FSAs who were TAD. As leadership, bringing SSOPP alive as a part of our daily workforce's safety awareness when training our young Sailors and Marines is paramount. Implementing OPNAVINST 5100.19F and NAVSUP P-486 Chapter 2 into the FSA orientation and training will enhance Sailor awareness and reduce mishaps.

Lessons Learned (LL) and Sanitized Safety Investigation Reports (SSIR)

During FY19 the Naval Safety Center developed and disseminated the following Lessons Learned and Sanitized Safety Investigation Reports for the afloat community:

1. LL 18-11 Submarine KOH Chemical Mishap
2. LL 19-06 Trailing Hand Technique (Afloat version)
3. LL 19-12 Antenna Dome Ripped from Mounting
4. LL 19-19 Right Work, Wrong Ship
5. SSIR 18-09 Surface MPDE Mishap
6. SSIR 18-10 Shipboard Fire in the Engine Uptake
7. SSIR 19-08 Shipboard Electrical Mishap
8. SSIR 19-11 Ship Ballast Tank Rupture

All of these Lessons Learned and Sanitized SIRs are available on the "Lessons Learned" pages of the Naval Safety Center's CAC-enabled website, https://intelshare.intelink.gov/sites/navsafe.

GLOSSARY

1MC	1 Main Circuit
AAV	Amphibious Assault Vehicle
ACE	Aircraft Elevator
AMW	Amphibious Warfare
AOSA	Afloat Operational Safety Assessment
ARG	Amphibious Readiness Group
BOATALT	Boat Alteration
CIC	Combat Information Center
CSG	Carrier Strike Group
CSMP	Current Ships Maintenance Project
COMNAVSURFLANTINST	Commander, Naval Surface Force Atlantic Instruction
COMNAVSURFPACINST	Commander, Naval Surface Force Pacific Instruction
CONREP	Connected Replenishment
CORPEN	Course Pennant
DFS	Departure From Specifications
ECP	Entry Control Point
FCCS	Flooding Casualty Control System
FR	Force Revision
FSA	Food Service Attendant
LCU	Landing Craft Utility
MCTP	Marine Corps Tactical Publication
MCWP	Marine Corps Warfighting Publication
MIP	Maintenance Index Page
MRC	Maintenance Requirement Card
NAVSEA	Naval Sea Systems Command
NAVSUP	Naval Supply Systems Command
NFIRS	National Fire Incident Reporting System
NSN	National Stock Number
NSTM	Naval Ships Technical Manual
NSST	Navigation, Seamanship, and Ship Handling Training
OD	Oil Distribution
OMMS NG	Organizational Maintenance Management System – Next Generation
OOC	Out of Commission
OPNAVINST	Office of the Chief of Naval Operations Instruction
ORM	Operational Risk Management
OFRP	Optimized Fleet Response Plan
OTSR	Optimum Track Ship Routing
PBED	Plan, Brief, Execute, and Debrief
PERMA	Plan/Embark/Rehearse/Move/Assault
PMS	Preventative Maintenance Scheduled
PFOR	Personal For
RAC	Risk Assessment Code
SECNAV	Secretary of the Navy
SIB	Safety Investigation Board
SMMO	Ship's Maintenance and Material Officer
SSOPP	Sound Shipboard Operating Principles and Procedures
TAD	Temporary Assigned Duty
TCRM	Time Critical Risk Management
WESS	Web-Enabled Safety System

NOTES:

SAFETY READS

Go to **https://www.navalsafetycenter.navy.mil** to read these additional Safety Articles published in 2019:

The Right Repairs Done on the Wrong Boat, by **LT Ken Reed**
Eight Neglected Bolts Almost Cause Deck Disaster, by **EMCS Nicholaus Francola**
A Good Monitor vs. an Effective Spot Check, by **FTC Shaun Wintink**
Out Thinking Unsafe Decisions, or How Not to Fall Over the Clothes Basket, by **Paul Widish**
What Does Degaussing Actually Do?, by **EMCS Nicholaus Francola**
Self-Serve Laundry is a Fire Waiting to Happen, by **LT Stephen Price**
Fires In-port Must be Reported, Too, by **CDR Chris Tarsa**
Are you Safety Aware or Safety Adverse, by **CDR Todd Morrison**
Berthing Rack Injuries: Be Careful Around that Coffin!, by **MMCS D. Jones**
Aqueous Potassium Carbonate System Inoperability and Reduced Status, by **MMAC Ethan Landers**
Avoiding Gym Injuries, by **BMCS Crystal Briggs**
Above Deck: Is Your Ship Using the Correct Life and Guard Lines?, by **CWO5 Richard Barr**
Do Your Emergency Eyewash Stations Work Correctly?, by **HMCS Jolando Lightner**
Lessons Learned: Being Cautious with Knives and Zip Ties, by **LT Erik Beason**
Wear Your Hearing Protection or You Won't Hear About it Later, by **LT Stephen Price**
USS Florida Missile Exercise Mishap Costly, by **MMAC Ethan Landers**
Managing Your Electrical Safety Program, by **EMNCS Heath Shirley**
Maintaining Safety in Shift Work, by **HMC Tracy Danley**
Double Check Equipment on Your IEM List, by **FTC Shaun Wintink**
Hazard Abatement Program Helps Boats Self-Assess, by **LT Ken Reed**
Air Flow Alarms Need Your Full Attention, by **BMCS Crystal Briggs**
Small Boat Operations, by **CWO5 Richard Barr**
UNREP Conning Orders and Correct Shackle Size, by **CWO Richard Barr**
Power Distribution Breaker and Fuse Panel Labeling, by **LT Stephen Price**
Fall Protection and Changes to the OPNAVINST 5100.19E, by **ETCS Gregory Reno**
Hydrogen Sulfide Gas Detection System, by **LT Stephen Proce**
Habits Not to Break, by **CDR Todd Morrison**
Afloat Hatch and Scuttle Injuries, by **MMCS Devan Jones**
Oil Contingency Plan, by **LT Stephen Price**
Remember the Test Fittings, by **GMC Travis Vanderbrink**
Respiratory Protection Management, by **HMCS Jolando Lightner**
Tools and their Uses, by **CDR Todd Morrison**
Safety Chairs and Deck Grating, by **GMC Travis Vandenbrink**
Afloat Parasense Refrigerant Leak Detectors, by **MMC D. Jones**
Preventable Class C Fire, by **EMCS Nicholaus Francola**
Electric Shock Mishap During Routine Lightbulb Replacement, by **EMCS Nicholaus Francola**
Fall Protection Hazard Associated With Neglected Maintenance, by **EMCS Nicholaus Francola**
Main Engine Brake Class Alpha Fires, by **LT James Kim/LT Stephen Price**

SHORE

DIRECTOR: MR. JONATHAN WILSON
DEPUTY DIRECTOR: MR. CHARLES GUM
SHORE: SAFE-CODE-21@NAVY.MIL

The Shore Safety Directorate (Code 20) directs, manages, coordinates, and assesses the planning and implementation for the Navy and Marine Corps safety and occupational health (SOH), industrial safety, traffic safety, and off duty for OPNAV N09F/COMNAVSAFECEN for policy, plans, and programs to meet Navy, DoD, and federal goals of eliminating workplace fatalities, injuries and illnesses, lost work time, and compensation claims, as well as cost and risk reduction and compliance with regulatory requirements to help prevent mishaps that degrade fleet readiness.

Jonathan Wilson, Director *Shore,* during a presentation on OPNAVINST 5100.23H

The Naval Safety Center completed the major rewrite of the Navy Safety Program Manual, OPNAVINST 5100.23H with multiple enhancements such as the creation of a Navy Safety Management System (SMS) and inclusion of the Traffic Safety, Recreational Off-Duty Safety, and Systems Safety programs. The most notable improvements are in Base Operating Support (BOS) safety services and hazard identification via workplace inspections.
These changes shift the Navy safety to more agency focus and outline the shared responsibility in accountability, authority, responsibility, and subject matter expertise. Midyear 2019, the Naval Safety Center went on the road visiting over 42 locations worldwide to help align the Navy's safety professionals under the new safety policy manual. Each event had an extensive 3-hour presentation discussing the latest changes to the instruction, including explaining the actual intent of the changes made to the Navy's safety policy as well as the OPNAV change process.
Overall, 1,675 personnel worldwide attended, providing an excellent opportunity for the Naval Safety Center's new Safety Community Manager for Safety and Occupational Health Management Series, 0018, to interact with the fleet, creating a positive atmosphere for discussion of the future of safety in the naval enterprise.

MISHAPS

Mishap Trends

Class A shore on-duty mishaps in FY 19 (Fig.1) increased from two to six. Of these mishaps three were fire or fire suppression related, one was damage due to flooding, one was a capsized vessel and one involved permanent total disability.
Since FY17, the Navy has reported one on-duty Class-A motor vehicle mishap every year. The injury in 2019 resulted in permanent total disability. The physical training fatalities in FY 19 (Fig.2) increased by one.

PMV Fatalities

Private motor vehicle (PMV) fatalities continue to be a concern and a focus of NAVSAFECEN due to the number of service members that either severely injured or killed each year.
PMV fatalities overall are showing a three-year downward trend and remain below the 10-year average of 32. (Figure 3)

Four-wheel PMV (PMV4) fatalities makeup 11 of these events and is at the 10-year average for FY19 (Figure 4).

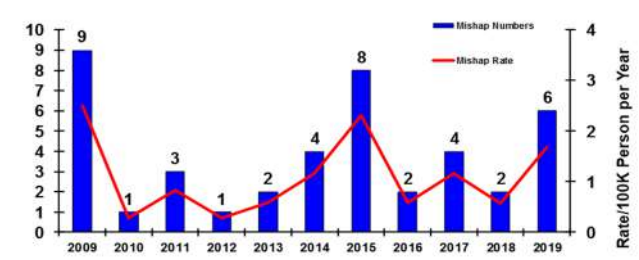


Figure 1

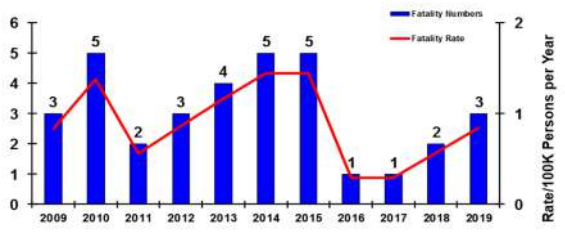


Figure 2

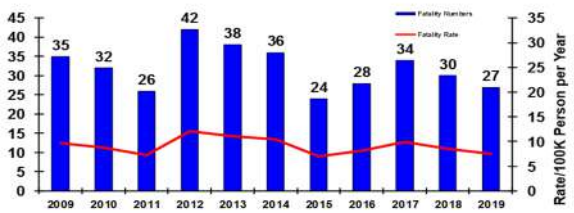


Figure 3

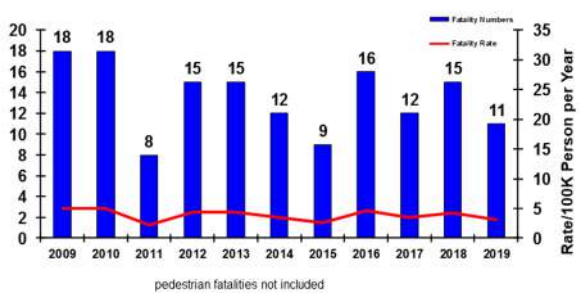


Figure 4

Analysis of all PMV2 fatalities and injuries from FY15-FY19 shows a dramatic increase in sport bike usage since FY17. These types of vehicles pose more risk due to the speed at which they can attain.
The Human Factors Analysis and Classification System (HFACS) identifies more than one factor attributed to an event in most PMV2 mishaps.
Skill-based errors such a poor technique are related directly to motorcycle operator inexperience or "not having enough time in the seat" to gain the skill sets needed for these types of vehicles. Improper braking, failing to maintain sufficient distance between vehicles, overcompensating, improper passing, as well as lack of situational awareness to surroundings, leads to the loss of control that the operator has and ultimately results in injuries or death.
NAVSAFECEN continues to promote training compliance of all PMV2 operators through completion of both Level I and II training.

USN Off-Duty and Recreational Fatalities

Off duty, recreational fatalities has significantly decreased for FY19 (Figure 6).
Three of the five deaths were accidental self-inflicted gunshots, one from an aircraft crash while sky diving, and one service member who was found to be unresponsive at home. Attention to accidental discharge of weapons was spotlighted with the NAVSAFECEN Sanitized Safety Investigation Report: SSIR 19-16 On-Duty Small Arms Mishap (negligent discharge) in August.

Civilian Lost Workdays

Civilian lost workdays continue to decrease since FY 17, as indicated by the Force Risk Reduction (FR2) data (Figure 7). Contractors and non-appropriated civilians are not included in these numbers. A civilian lost workday is defined as absence from work because of illness or injury. Reduction of civilian lost-time injuries has been a focus in the Navy and continues to be one of the areas targeted in ongoing mishap-reduction. The five-year average lost workday rate is 25. The top 10 professions that make up 36 percent of the lost time cases include fire protection and prevention, painting, marine machinery mechanic, rigging, electrician, sheet metal mechanic, shipfitting, pipefitting, and police professions. NAVSAFECEN continues to ensure that commands are aware of the importance of paying attention to their lost workday rates and mishaps so they can effectively target resources and preventive efforts in these areas.

Military Lost Time Case Rate

Military lost time case rate continues to decrease since FY16, as indicated by the Force Risk Reduction (FR2) data (Figure 8). Late reporting might change FY 19's numbers. Overall, the highest number of lost days by injury continues to be motorcycle riders injured in transportation incidents followed by slip, trips, and falls. Additional factor injuries such as sports-related occurrences are next. Off-duty injuries make up the majority of the lost time case rate. NAVSAFECEN continues to spotlight off-duty injuries in lessons learned reports and are working with multiple organizations researching ways to decrease off-duty injuries with PMV2. Initiatives, such as the "Rider-Down Report," are emailed monthly to all motorcycle safety representatives with updates of motorcycle mishaps occurring throughout the Navy and Marine Corps. The report includes recommendations to use the information provided as part of their motorcycle training and mentorship programs.

Two-Wheel PMV (PMV2) fatalities have increased slightly to 15 and are at the 10-year average (Figure 5).

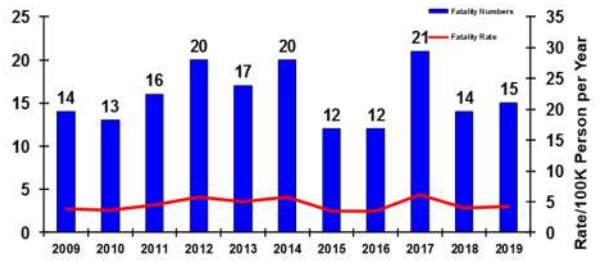


Figure 5

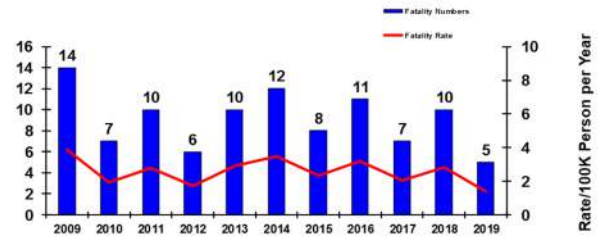


Figure 6

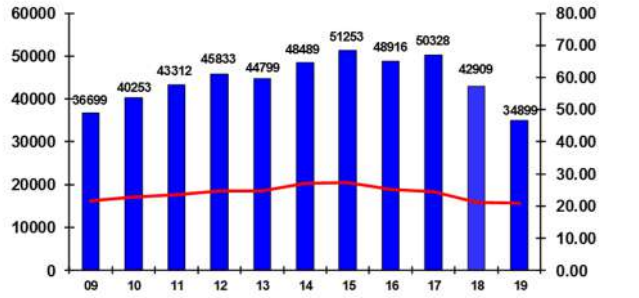


Figure 7

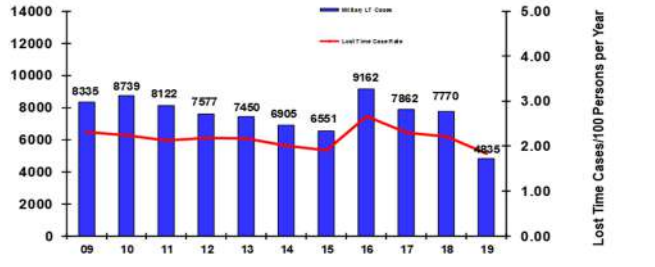


Figure 8

Lessons Learned (LL) and Sanitized Safety Investigation Reports (SSIR)

During FY19 the Naval Safety Center developed and disseminated the following Lessons Learned and Sanitized Safety Investigation Reports for the Shore community:

1. LL 18-15 Navy Off-Duty Firearm ND
2. LL 18-18 Why Don't We See Motorcycles
3. LL 19-01 Hearing Loss
4. LL 19-07 Shore Fixed Ladder Fatality
5. LL 19-08 Trailing Hand Technique (Shore/Civ version)
6. LL 19-10 Fixed Fire Suppression Systems
7. LL 19-14 Office Space Mishaps
8. LL 19-21 Soccer Goal Anchoring

All of these Lessons Learned and Sanitized SIRs are available on the "Lessons Learned" pages of the Naval Safety Center's CAC-enabled website, https://intelshare.intelink.gov/sites/navsafe.

GLOSSARY

BCA	Body Composition Assessment
BOS	Base Operating Support
FR2	Force Risk Reduction
FY	Fiscal Year
HFACS	Human Factors Analysis and Classification System
LCI	Lower Confidence Interval
NAVADMINs	Navy Administrative Messages
NAVSAFECEN	Naval Safety Center
OPNAV	Office of the Chief of Naval Operations
OPNAVINST	Office of the Chief of Naval Operations Instruction
PARFQ	Physical Activity Risk Factor Questionnaire
PMV	Private Motor Vehicle
PMV4	Four-wheel Private Motor Vehicle
PMV2	Two-Wheel Private Motor Vehicle
PRP	Physical Readiness Program
PT	Physical Training
SMS	Safety Management System
SSIR	Sanitized Safety Investigation Report
UCI	Upper Confidence Interval

NOTES:

EXPEDITIONARY

DIRECTOR: DON CIESIELSKI
ORM POLICY MANAGER: TED WIRGINIS

The ORM Expeditionary Warfare Directorate provides statistical trend analysis based upon safety climate surveys identifying six areas of safety culture: communication, leadership, knowledge, involvement, resources and reporting.

FY19 EXPEDITIONARY SUMMARY

FY19 Expeditionary Directorate FY19 Review

The Expeditionary Directorate has continued to refine and better shape the Expeditionary Operational Safety Assessment (EOSA) process by using the four principals of risk management identifying areas of unmitigated risk to the command as it relates to risk to mission/risk to force. Additionally, we help to ensure the command understands who can accept that risk within the command or when and how to elevate it to the next level in the chain of command. This past year the directorate launched a new initiative called a Pulse Scan.
This micro-narrative method provides an approach to capture, analyze, and identify command behaviors and leading indicators that are not normally identified through traditional measures, such as safety reports or assurance visits.
This method enhances leadership's ability to identify risk factors, promote awareness, and enable targeted risk mitigations along with corrective actions. Additionally, we identified a gap in safety assurance coverage within the Naval Beach Groups, which included the assault craft, and beach master units along with the amphibious construction battalions. Working with SURFOR Safety, we recommended closing this gap by providing assurance coverage within the Expeditionary Directorate. Over this past year, we have conducted an EOSA on all Naval Beach Group Units for both East and West coasts. Finally, we fielded the newly designed Dive Jump Reporting System in February, which captures all DoD dives and all Navy and Marine Corps parachuting events.

Mishap Trend Summaries

With the exception of Shore/Ground, NECC continues to show a positive trend in mishap reduction. 2019 was a good year with a significant reduction from 2018.

NSW also shows a positive trend in mishap reduction. The only exception is Auto (PMV4); however, 2019 was a good year with a reduction from 2018.

Overall, NBG showed a positive trend in mishap reduction. The only exceptions are Auto (PMV4), Motorcycle (PMV2), and Ship. PMV4 was the only mishap classification that saw an increase in reporting for 2019.

Assessments and Assessment Totals

Expeditionary Operational Safety Assessments (EOSA) - **12**
USN/USMC Paraloft Assessments/Inspections (P3) – **11**
High Risk Training Assessments – **4**
Diving Safety Assessments (DSA) - **50**
Operational Risk Management Assessments (ORM) - **4**
Trained over **3,800** Navy and Marine Corps divers and parachutist on the new Dive Jump Reporting System (DJRS) both overseas and stateside.

Opened and closed Class A Mishaps

Class A Reports Closed in 2019

	Mishap Command	Date of Mishap	Community
	SBT-20	8 Nov. 2018	Expeditionary

Outstanding MISREC's

Consolidated TYCOM	Currently Due	NUMBER OF YEARS 1	2	3	4	5	6	7	8
OPNAV N95	8	0	0	6	2	0	0	0	0
NSW	1	0	0	1	0	0	0	0	0
	9	0	0	7	2	0	0	0	0

Studies and Data Analytics

a) Micro-Narrative Capture (Pulse Scan) - The micro-narrative method is an innovative, narrative-based research tool that gives unbiased feedback of happenings at the command. The narrative is a free thought written story, and from that the analysis conducted by NAVSAFECEN personnel generates actionable insights and guides command interventions.

b) Collaborative Efforts - In conjunction with the Navy and Marine Corps Public Health Center in Portsmouth, Va., we researched and evaluated the risk associated with sun exposure for NSW and NECC personnel. NSW and NECC personnel were diagnosed with skin cancers at a rate comparable to the rest of the Navy population even though their exposure is higher. This may be due to the full body screening required for most personnel assigned to these commands during their annual physical health assessment (PHA).

c) In conjunction with the Center for Naval Analysis (CNA), Ernst & Young, Commander, Naval Air Forces (CNAF) and internally with NAVSAFECEN Aviation Directorate, we researched possible drivers for aviation ground mishaps (AGM's) using the perform to plan (P2P) process. This is an ongoing research collaboration project to provide leading indicators and possible risk drivers that may be primary causes of increased risk of AGMs.

Lessons Learned (LL) and Sanitized Safety Investigation Reports (SSIR)

During FY19 the Naval Safety Center developed and disseminated the following Lessons Learned and Sanitized Safety Investigation Reports for the Expeditionary community and US Marine Corps:

1. LL 19-05 Embedded Trainers
2. LL 19-09 UTV Mishaps
3. LL 19-11 Demolitions Training
4. SSIR 18-08 MTVR Rollover
5. SSIR 19-05 Rocket Live Fire Mishap
6. SSIR 19-06 Hot Gun Clearing Mishap
7. SSIR 19-07 LAW Firing Mishap
8. SSIR 19-16 On-Duty Small Arms Mishap

All of these Lessons Learned and Sanitized SIRs are available on the "Lessons Learned" pages of the Naval Safety Center's CAC-enabled website, https://intelshare.intelink.gov/sites/navsafe.

GLOSSARY

AGMs	Aviation Ground Mishaps
CNA	Center for Naval Analyses
CNAF	Commander, Naval Air Forces
DJRS	Dive/Jump Reporting System
DSA	Diving Safety Assessments
EODMU	Explosive Ordnance Disposal Mobile Unit
EOSA	Expeditionary Operational Safety Assessment
FY	Fiscal Year
MISRECs	Mishap Recommendations
NECC	Naval Expeditionary Combat Command
NSW	Naval Special Warfare
ORM	Operational Risk Management
P2P	Perform to Plan
P3	Paraloft Assessments/Inspections
PHA	Physical Health Assessment
PMV4	Four-Wheel Private Motor Vehicle
PMV2	Two-Wheel Private Motor Vehicle
SURFOR	Surface Forces

NOTES:

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www.NavalSafetyCenter.navy.mil


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